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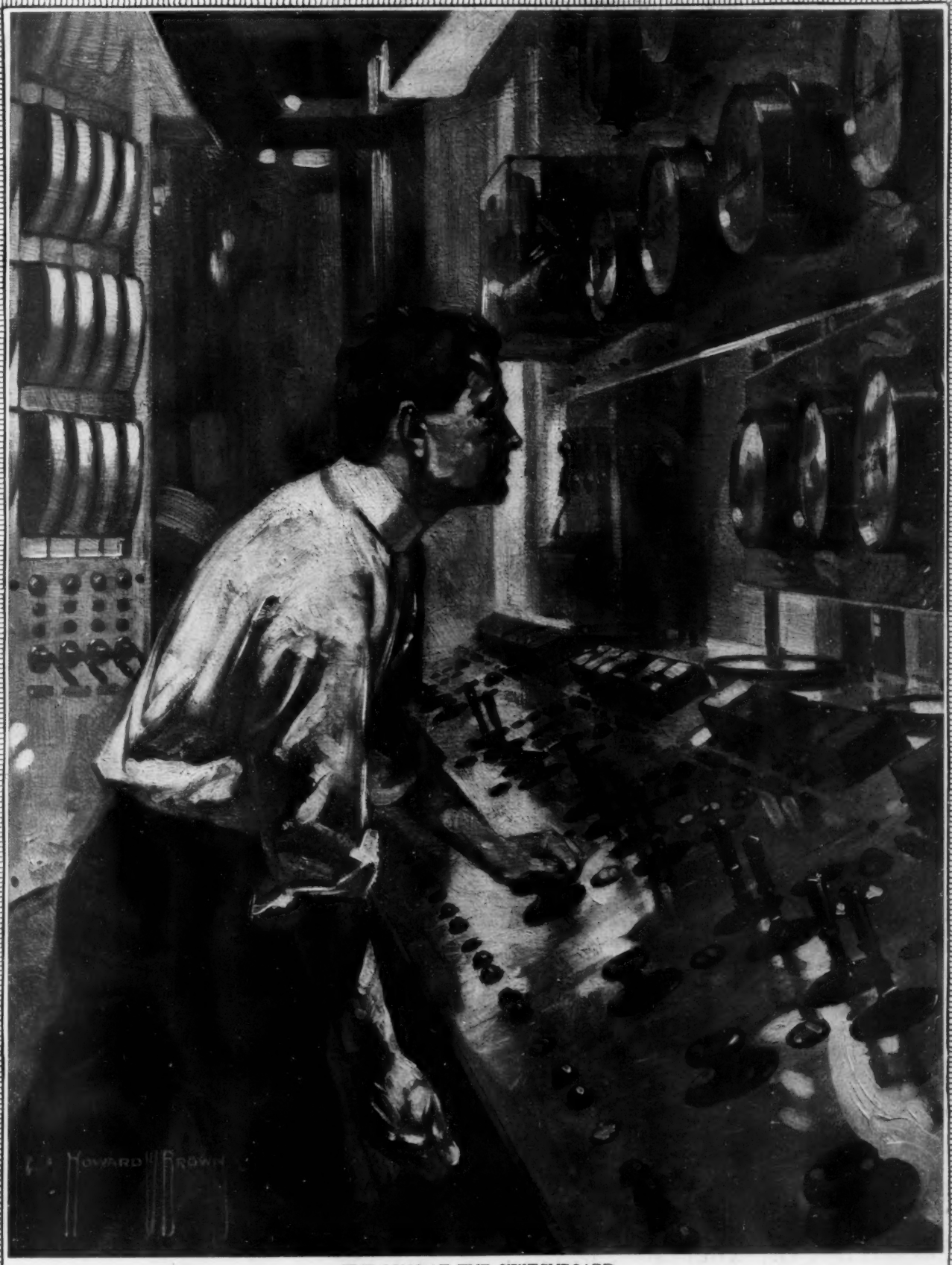

THE MAN AT THE SWITCHBOARD

Vol. CX. No. 17
April 25, 1914

Munn & Co., Inc., Publishers
New York, N. Y.

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Fuel and Repairs

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In three years' time supplies and repairs occasionally cost as much as the original price of a car.

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(2) Your piston clearance.
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(4) Your bore and stroke.
(5) Your engine speed.
(6) The size and location of valves.
(7) Your cooling system.

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Gargoyle Mobiloil "E,"
Gargoyle Mobiloil "Arctic."

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Correct Lubrication

Explanation: In the schedule, the letter opposite the car indicates the grade of Gargoyle Mobiloil that should be used. For example: "A" means "Gargoyle Mobiloil A." "Arc." means "Gargoyle Mobiloil Arctic." For all electric vehicles use Gargoyle Mobiloil "A." The recommendations cover both pleasure and commercial vehicles unless otherwise noted.

MODEL OF CARS	1910		1911		1912		1913		1914	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Abbott Detroit	A	Arc.	A	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
Alco	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	...	...	...
American	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Autocar (4 cyl.)	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
" (4 cyl.)	A	E	A	Arc.	A	Arc.	...	...	...	...
Avery	A	?	A	E	A	A	A	A	A	A
Buick (2 cyl.)	A	A	A	A	A	A	A	A	...	...
" (4 cyl.)	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Cadillac (4 cyl.)	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Carterear	A	E	A	E	A	E	A	E	Arc.	Arc.
" Cont'l.	A	E	A	Arc.	A	Arc.	A	Arc.	...	...
Case	...	...	A	A	Arc.	A	Arc.	A	Arc.	Arc.
Chalmers	Arc.	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.	A	A
Chase	B	B	B	B	B	B	B	B	B	B
Cole	Arc.	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Delaunay-Belleville	B	A	B	A	B	A	B	A	B	A
E. M. F.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	...	...	...	...
Fiat	A	A	B	A	A	A	B	A	B	A
Flanders	E	E	E	E	Arc.	Arc.	...	...	...	...
" (6 cyl.)	...	...	...	...	...	...	Arc.	Arc.	...	...
Ford	A	Arc.	E	E	E	E	E	E	E	E
Franklin	B	Arc.	A	Arc.	A	Arc.	A	Arc.	A	A
" Cont'l.	B	A	B	A	A	Arc.	A	Arc.	...	...
G. M. C.	...	...	...	...	Arc.	Arc.	A	Arc.	A	Arc.
Havers 6-44	...	...	A	Arc.	A	Arc.	A	Arc.	A	A
Havers 6-60	...	...	...	...	...	...	...	...	Arc.	Arc.
Haynes	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Hudson	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Hupmobile "20"	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	...	...
" "32"	...	...	...	...	...	...	A	Arc.	A	Arc.
I. H. C. (air)	...	...	...	...	...	...	B	A	B	A
" (water)	...	...	...	...	...	...	A	A	A	A
International	B	A	B	B	B	A	...	...	...	...
Interstate	A	E	A	Arc.	A	Arc.	A	Arc.	...	...
Jackson (3 cyl.)	A	A	...	...	...	...	...	...	...	...
" (4 cyl.)	A	Arc.	A	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
Jeffery	...	...	...	...	...	...	...	...	A	A
Kelly	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	A
King	...	...	A	E	A	E	A	E	A	A
Kline Kar	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Knox	B	A	B	A	B	A	B	A	B	A
Krit	A	A	A	A	A	A	A	A	A	A
Locomobile	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Lozier	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.	Arc.
Mack	A	E	A	E	E	E	E	E	A	A
Mack, Jr.	...	...	...	...	...	...	...	...	A	Arc.
Marion	A	E	A	E	A	Arc.	A	Arc.	...	...
Marmon	E	E	E	Arc.	A	Arc.	A	Arc.	A	Arc.
Maxwell (2 cyl.)	E	E	E	E	E	E	...	...	...	...
" (4 cyl.)	E	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
" (6 cyl.)	...	...	...	...	...	...	Arc.	Arc.	Arc.	Arc.
Mercer	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Mitchell	Arc.	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Moline	A	E	A	Arc.	A	Arc.	A	Arc.	...	...
Moline Knight	...	...	...	...	...	...	...	...	A	A
Moon (4 cyl.)	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Moon (6 cyl.)	...	...	...	...	...	...	...	...	Arc.	Arc.
National	A	A	A	A	A	A	A	A	A	A
Oakland	A	E	A	Arc.	A	Arc.	A	Arc.	Arc.	Arc.
Oldsmobile	A	E	A	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
Overland	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Packard	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	A	Arc.
Paige Detroit	E	E	A	Arc.	A	E	A	E	A	A
Pathfinder	...	...	...	...	...	...	A	Arc.	Arc.	Arc.
Peerless	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pierce Arrow	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
" Cont'l.	...	...	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Pope Hartford	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Premier	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Rambler	A	A	A	Arc.	Arc.	Arc.	Arc.	Arc.	...	...
Regal	A	E	A	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Renaults	A	Arc.	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Reo	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
S. G. V.	...	...	B	Arc.	B	Arc.	B	Arc.	A	Arc.
Selden	A	E	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Simplex	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Speedwell	Arc.	Arc.	A	Arc.	A	Arc.	Arc.	Arc.	Arc.	Arc.
" "Mead"	...	...	...	...	...	...	A	Arc.	B	A
Stearns	Arc.	Arc.	A	Arc.	A	Arc.	...	...	...	...
" "Knight"	...	...	...	...	A	A	A	A	A	A
Stevens Duryea	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Stoddard-Dayton	Arc.	Arc.	A	A	A	A	A	A	...	...
" "Knight"	...	...	...	...	A	A	A	A	...	...
Studebaker	B	B	A	Arc.	Arc.	A	Arc.	A	Arc.	Arc.
Stutz	...	...	...	...	A	A	A	A	A	A
Velie 9-45	A	E	A	Arc.	A	Arc.	A	Arc.	A	Arc.
Velie 9-50	...	...	...	...	...	...	...	...	Arc.	Arc.
Walter	A	E	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
White (Gas)	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.
Winton	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.	Arc.

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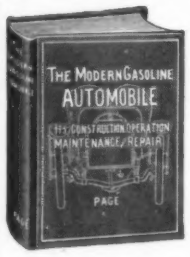

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***By* HON. JOSEPHUS DANIELS, Secretary of the Navy**

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SEVENTIETH YEAR

SCIENTIFIC AMERICAN

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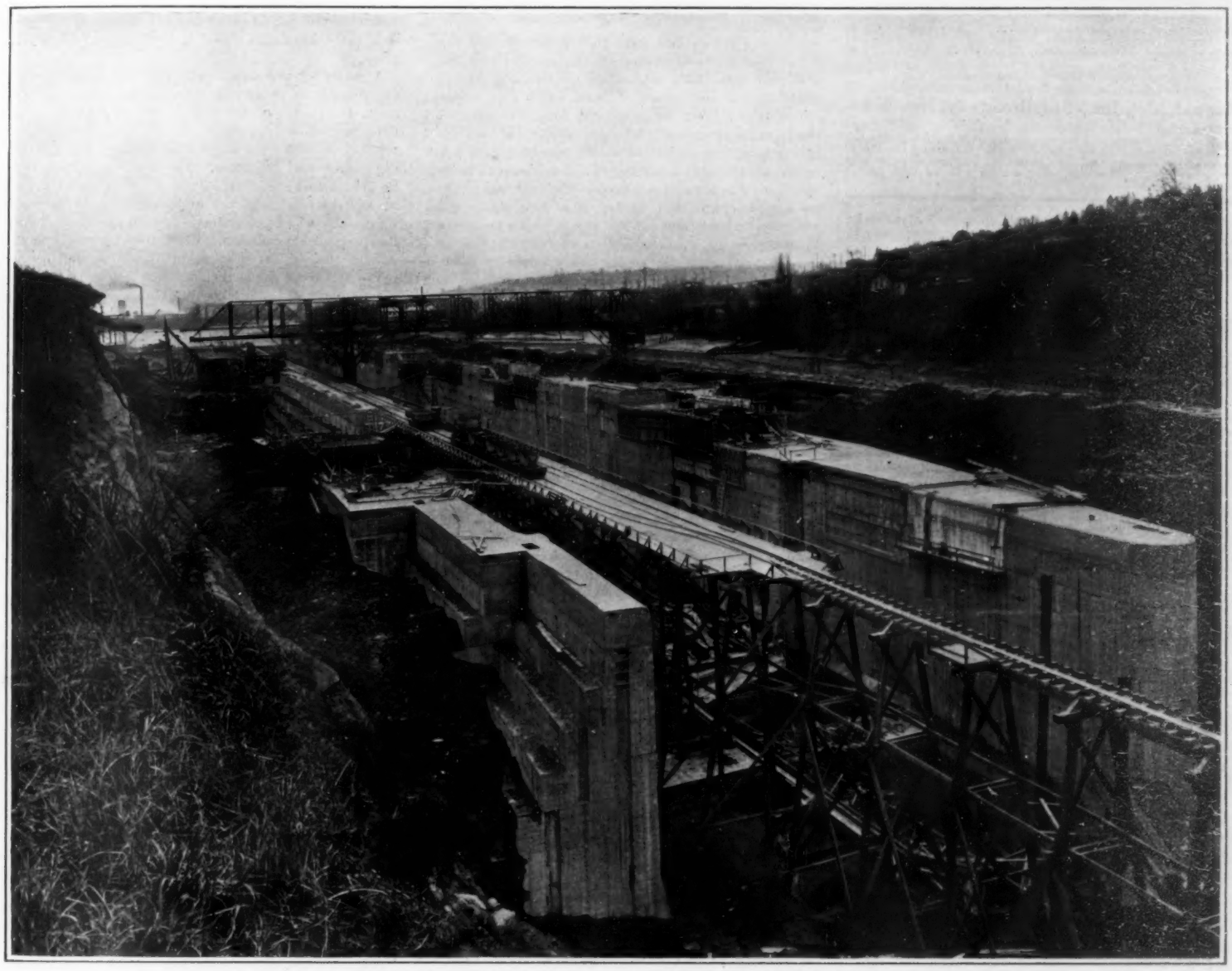

Length, 825 feet; width, 80 feet; inside height, 56 feet. Estimated cost, $3,275,000 for the locks and canal.

Lake Washington canal lock.

The Lake Washington Canal Locks

AN important work now nearing completion is the great locks of the Government canal at Salmon Bay, by means of which shipping will be able to pass from Puget Sound at Seattle to Lakes Washington and Union. The works are so far advanced that the first ship is expected to pass through the waterway early in 1915.

The public mind has been so filled with the story of the construction of the Panama Canal and its great locks at Gatun and elsewhere, that it is apt to overlook the fact that several other works of this character of great magnitude are also being carried out. The Lake Washington canal and locks are a case in point. The lock is 825 feet long, 80 feet wide on the inside and 56 feet high. The walls of concrete are 53 feet in thickness at the bottom and 8 feet at the top. This structure is known as the Big Lock. The Small Lock is 30 feet wide and 160 feet long. The latter is being built for the use of small boats, and, of course, it will result in the saving of much expense, since a large part of the traffic is of such size as not to call for the use of the greater structure.

When the locks are finished the level of Lake Union will be raised to twenty-one feet above the high water mark, and both this lake and Lake Washington with the factories along their shores, of which there are many to-day with the prospect of a great many more in the future, will be in direct water communication with the Pacific. One great advantage of the new works is that since the water in the lakes is fresh, ships will be able to pass through the locks and relieve themselves of barnacles and other marine growths which will drop off from their bottoms, leaving them clean for the next voyage. Also, the canals will have a distinct value to the Navy, whose ships of the medium and smaller sizes—all ships, in fact, except the larger dreadnoughts—will be able to enter the fresh water lakes if emergency or other causes should render it desirable.

The first estimate for this work was $2,275,000 for the locks, $1,000,000 for the dredging. The cost of the locks is being paid by the United States Government and that of the canal by the city and county.

General Gorgas Honored in England

ON March 23rd, Surgeon-General Gorgas, of the United States Army, lectured in London before the Royal Society of Medicine on his sanitary work in Panama. In the course of his lecture he modestly admitted that if the Americans had known no more in 1904 about the mode or transmission of malaria and yellow fever than was known in 1880, when the French tried to solve the problem of sanitation on the Isthmus, they probably could not have done any better than did the latter. The same night General Gorgas was entertained by the medical profession at dinner at the Savoy Hotel, and on the 24th he received the degree of Doctor of Science, *honoris causa*, at a special convocation held at Oxford University, for his work in rendering the construction of the Panam Canal possible by stamping out yellow and malarial fevers. The London *Times* editorially refers to Gen. Gorgas as "indisputably the foremost sanitary officer in the world," and one who "has perhaps done more than any other man to throw open the tropics, or to show how they can be thrown open, to habitation by Caucasians."

Motor Omnibus Service for Bolivia.—At first blush, the mountainous portion of Bolivia would not appear just the place for the establishment of a motor 'bus service. Yet one is to be established there. Four six-cylinder 'buses have been purchased by a syndicate to replace mule-drawn coaches which heretofore have been used. The route is approximately 100 miles in length, and the 'buses must always be operated at an altitude of 7,000 feet or more. The service will link the cities of Potosi and Sucre, which latter is the capital of Bolivia. Leaving the former city, there is a climb of five kilometers where the highest pass in the Andes (14,000 feet elevation) is crossed. The average grade is about 17 per cent. Three of the 'buses will carry 11 passengers each, in addition to a certain amount of freight. The fourth is a *de luxe* extra fare car with heavily upholstered seats and accommodations for only seven passengers. All of the cars are electrically lighted and started. They will be operated on a regular schedule, making the trip one way in 12 hours.

SCIENTIFIC AMERICAN

Founded 1845

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Highway Problem in New York State

THE State of New York is engaged in building twelve thousand miles of road, which, according to Governor Glynn, will wear out forty years before it is paid for. That is an astounding statement; and unfortunately it is not more astounding than it is true. This fact and many others of an illuminating and extremely disconcerting character were contained in a recent message of the Governor to the Legislature. The message is written in the direct and unadorned style which characterizes the Governor's utterances, and it contains an array of facts of such great importance to the people of this State, that we could wish to see a copy of this message placed in the hands of every voter throughout the State.

The question of the proper construction and maintenance of roads is not a new one in the columns of this journal. For many years, and during the whole period in which the country, awakened to the sense of its need, has been giving attention to the matter of highway construction, the SCIENTIFIC AMERICAN has emphasized the fact that the problem is more one of maintenance than of construction. The various States have built new macadam roads upon the most approved modern principles, and these roads, at least in late years, have been as good as any that could be constructed. Unfortunately the State authorities have been slow to realize that, of all civil engineering constructions, the macadam road is the one of all others that needs incessant supervision, and immediate and most careful repair whenever and wherever the signs of breaking down and general disintegration are seen.

The macadam road is admirably adapted for the class of highway traffic which passed over it in the period preceding the appearance of the automobile and the motor truck. For horse-drawn traffic it is ideal, and, with a reasonable amount of supervision and repair, it may be regarded as a permanent structure. To-day, however, such are the speeds and weights of the automobile and motor truck, and so greatly have they multiplied in numbers, that the macadam road has proved unequal to the burden laid upon it; for even where the materials are available for treating its surface, the cost of maintenance has reached a figure which renders it an uneconomical construction and invites a search for some other type of road, which will cost no more, or but very little more, to construct, and whose annual repairs bills will be reasonable.

The brick road offers such a substitute. Its first cost is not prohibitive; it is very durable; and the annual cost of repairs under a careful supervision is almost negligible. A substitute whose first cost is less than that of the brick road, but regarding whose cost of upkeep there is less data available, is the concrete road.

Now a first-class macadam road costs in this State from $10,000 to $13,000 a mile to build; a concrete road costs from $12,000 to $16,000 a mile; and a brick road costs from $20,000 to $25,000 a mile. Thus far the experience of the modern road builder with concrete has been limited. Michigan has roads of this character in one county, and the results have been very satisfactory; but the roads have not been in service long enough to justify any conclusion as to their permanence and economy. In hundreds of cities brick roads have been laid and have been down for many years, which, without exception, have demonstrated their durability. Roads of this character, which have been in service for twenty-five years, have stood up under the test of the hardest kind of traffic. What is more to the point is that the annual cost of maintaining these brick roads has been remarkably low, ranging from practically nothing to from $10 to $50 per mile.

Now in New York a mile of macadam costing $12,000 would not last over ten years, and it costs $1,000 a year to maintain and surface such a road. At the end of the ten years the roads must be rebuilt, and the cost of the reconstruction would be $6,000 a mile. The total expenditure for twenty years on a macadam road amounts to $36,000, including $12,000 for building, $18,000 for maintenance, and $6,000 for rebuilding at the end of the first ten years.

Compare this with the total expenditures for ten years on a vitrified brick road, which will amount to $26,000 only, if we allow a maximum of $25,000 a year for building and a maximum figure of $50 a year for maintenance.

Governor Glynn advocates the use of vitrified brick rather than concrete because the State geologist informs him that New York State has an inexhaustible and widely distributed deposit of shale, which may be made the basis of a brick industry large enough to supply all the local requirements with materials of the best quality. The Governor advocates the use of prison labor in making the bricks, leaving the State roads to be constructed by free labor working under contractors or in the employ of the State itself. It is estimated that by this plan brick roads can be constructed at a cost of $15,000 per mile. Now on this basis the total cost of a mile of brick road for twenty years would be $16,000, including $15,000 for the original construction and twenty years of maintenance at $50 a year. The total cost of a macadam road for the same period, as we have shown above, is over double this sum, or $36,000. It is pointed out that the magnitude in the economy thus proposed is shown by the fact that the total saving in 7,300 miles of road yet to be constructed will amount to $146,000,000 in the twenty years after their completion, or more than the total cost of constructing the State's entire system of highways.

That some very radical change must be made in the present plans for the construction of our State highways is shown by the following facts: One hundred million dollars has been voted for the construction of the new highways in New York State. If the future roads cost as much as those which have been built, it will require an additional thirty million to complete the whole system. On New York's 12,000 miles of macadam road, the annual cost of maintenance will be $12,000,000. The total cost of the roads will be $130,000,000, and at the end of the ten years, which under heavy automobile and motor traffic is the term of life of a macadam road, the State will have little to show for its expenditure of $250,000,000. Furthermore, in twenty years thereafter the tax for highways will be at least $20,000,000 each year, if the roads are to be kept in proper condition.

"Every year," says Governor Glynn, "the taxpayers of New York will be compelled to pay $20,000,000 for maintenance. Every year they will be forced to pay $5,000,000 in interest charges on their bonds. Every year they will be compelled to contribute $2,500,000 to the Sinking Fund to take up the bonds when they mature; and every year they will be required to pay additional millions to rebuild part of the roads on which they are lavishing these tremendous sums. In other words, New York must either change its road policy or prepare to levy a perpetual and yearly road tax of $2 on every man, woman and child within its borders."

The Medical Congress and Our Sewage Scandal

WHAT expressions of disgust and horror were voiced by the distinguished foreign medical men as they sailed into the harbor of this city last week, we have not been informed. But surely they could not have failed to observe that Manhattan is an island surrounded on all sides by sewage. Deluded by the notion that the North, the Harlem, and the East Rivers were really flowing rivers of salt water, and that salt water has an unlimited capacity for digesting sewage, we have been pouring into these bodies of water the excreta of the city for years, without the least concern, until matters have become so serious that it has actually been necessary to dredge out the docks to remove accumulations of sludge.

It requires no critical analysis to reveal the foul conditions of the harbor. The floating refuse is all too evident to the casual observer from the steamship decks, and it must remain a disgrace to the city until adequate methods of sewage disposal are adopted. Fortunately steps in this direction have already been taken. During the administration of Mayor Gaynor a commission of five experts on sewage disposal and engineering was appointed to investigate conditions and to propose remedial measures. After a careful study of the matter, a plan was outlined which we explained in the columns of the SCIENTIFIC AMERICAN about a year ago. It consisted in establishing treatment plants on islands in the East River, and on an artificial island in the lower bay where most of the sewage could be treated to have the solids removed and taken away by tank steamers, while the liquids could be discharged into the surrounding waters after being rendered innocuous. The most spectacular feature of the report was the plan for a tunnel from Manhattan under Brooklyn to an artificial island in the lower bay, and this was dwelt upon to such an extent by the papers as to be considered the chief station of sewage treatment, whereas the plans called for the treatment of twice as much at Ward's Island. Unfortunately, because of its spectacular nature, the plan for an artificial island came to be looked upon as not feasible, even though it involved no departure from well-known engineering practice, and was thoroughly endorsed by competent engineers in addition to the engineers of the Commission. Realizing this, the Commission found it necessary to modify its plans.

A policy of progressive construction is now recommended. It is urged that intercepting sewers be built along the shores of the East River on both sides and that they be led to filter stations, where the sludge will be removed from the sewage and the liquid matter discharged into the river. The sludge would have to be hauled away in tank steamers. This would involve an immediate expenditure of $4,000,000. But it would represent part of the ultimate system as originally outlined by the Commission. When the city was ready to extend the system farther, a tunnel would be run under the river connecting the two intercepting mains, a pumping plant would be built on the Brooklyn side and a tunnel would be run from there through rock to the artificial island in the lower bay. This would involve an expenditure of $13,000,000 more, according to present estimates, while the work already done would fit into the system without requiring any reconstruction or waste of the original outlay. But before this extension was built, the plant at Ward's Island would be installed to relieve conditions in the upper part of the city.

In the mean time possibly some plan may be evolved for utilizing the sludge. The matter has been given serious consideration, but so far no method has been brought forth for utilizing the material, and apparently nothing can be done but to haul it away in tank steamers. Here it seems is a problem for the inventor to solve.

We are pleased to note that the new administration shows an eagerness to take up this pressing problem of sewage disposal. The Mayor and the Board of Estimate are investigating the report of the Commission, and the matter is to be considered further at a second meeting next month. We realize that matters of such great importance must be taken up with due deliberation. But the problem has already received exhaustive study at the hands of a commission of competent engineers, and we cannot but urge that their plans be pursued with all speed.

The Problem of Our Navy

THE series of articles on "The Problem of Our Navy," which has been running consecutively for the past two months in this journal, is now drawing to a close. We cannot forbear drawing attention to the fact that the serious crisis which has developed over night in the Gulf of Mexico is a striking illustration of the necessity of this country's possessing a navy whose ships are prepared to respond instantly to the call of the President, and proceed to any point where it is necessary to make a demonstration of the power of the United States and of its determination to secure for its flag due respect and for its citizens, whether military or civilian, proper treatment.

The last article of the Naval series, written by the Secretary of the Navy, which will appear in our next issue, will deal with an important element of the navy problem under the title: "How to Make the Navy an Economic Asset."

Biological Effects of Blue-violet Rays

THE ordinary data of physical climatology are of limited value when applied to the solution of biological problems. Thus air-temperature is well known to be of much less significance in this connection than direct solar radiation. Moreover, recent studies make it evident that gross solar radiation is less important, biologically, than radiation of particular wave-lengths, especially the blue-violet. H. A. Spoehr has been making comparisons at Tucson, Arizona, between the measurements of solar radiation as a whole, obtained by means of the Smithsonian pyrheliometer, and measurements of blue-violet radiation with an oxalic acid photometer. He finds that the intensity of the latter shows sudden and unpredictable variations quite independent of the variations in total intensity. Winter values are decidedly less than those of summer, while the afternoon is generally weaker than the morning. Reflection from cumulus clouds appears to increase the values.

Engineering

England Prefers Hydraulic Gun-Operating Gear.—Some years ago Great Britain, which has used exclusively hydraulic operating gear for her guns and turrets, made an extensive trial of electrical gear on the battle-cruiser "Invincible." Two different electrical systems were fitted in the barbettes which carried the eight 12-inch guns. It is stated that none of the systems has come up to expectations, and they are now being removed to make way for hydraulic installations.

The Merchant Tonnage of the World.—The latest figures showing the tonnage of the merchant fleets of the principal maritime powers, prove that Great Britain still holds her commanding lead, with a tonnage nearly one third greater than that of all the other maritime powers combined. Thus Great Britain possesses 20,275,791 tons; Germany, 4,998,746; United States, 3,489,736 tons, the greater part of which is domestic shipping; Norway, 2,475,323 tons; France, 2,246,504 tons; Japan, 1,700,062 tons; and Italy, 1,571,761 tons.

The Increasing Size and Speed of Submarines.—The day is approaching when seagoing submarines of high surface-speed will accompany the main fleet on the high seas. Large vessels of this type, of 21 knots speed, have been designed for our Navy. Great Britain is building, in the "Nautilus," the largest submarine in existence, which is intended to be as seaworthy while on the surface as the latest type of destroyer. Its surface speed will be not less than 21 knots and it will have a submerged speed of from 15 to 16 knots; it will carry six torpedo tubes, and the surface displacement will be about 1,500 tons.

A French Sixteen-Gun Dreadnought.—The French naval authorities are so well pleased with their four-gun turrets, that their latest class of dreadnoughts is to be fitted with four of these turrets, carrying among them a broadside of no less than sixteen 13.4-inch guns. These ships will be able to concentrate eight guns ahead and astern, so that in point of numbers their all-round fire will exceed that of our own "Pennsylvania," which can fire six 14-inch guns ahead and astern, and twelve on the broadside. The British in the "Queen Elizabeth" have decreased the number and increased the power of the guns, these ships carrying each eight 15-inch guns.

The Navy and Columbia University.—The Secretary of the Navy has expressed his gratification and pleasure in noting the co-ordination in the Post-Graduate Department of the United States Naval Academy at Columbia University, and the advance made by young naval officers under instructions in the lecture rooms and laboratories of that university. Eighteen officers are taking the course at Columbia, in which the theories of thermodynamics, machine design, electricity and radio-telegraphy are adapted for practical application in the naval service, and in which special subjects and problems that are encountered on board ship are worked out.

Steam Shovel Work Completed in Culebra Cut.—The dry excavation in Culebra Cut was terminated on March 31st, when the three 95-ton steam shovels that were engaged in lessening the pressure on the east Culebra slide north of Gold Hill, were withdrawn and made ready for dismantling. When the steam shovel work was completed on the bottom of the cut in September, 1913, no less than thirteen steam shovels were engaged on high levels at various points of the cut. That number has been gradually reduced. At the end of November six were in service; at the end of December, four. Two more were removed late in February, and now the finishing up at Culebra is being accomplished by dredges.

Canal to Open About July 1st.—Col. Goethals has announced that, unless unforeseen developments occur at the Cucuracha slide, and this is not likely, the canal will be opened to commercial vessels about July 1st of this year. The dredges are working on the channel which has been cut through the slide, and the present effort is to make the channel so broad that these dredges will not interfere with the passing of ships. Incidentally, it may be mentioned that Col. Goethals is opposed to the exemption of tolls "because," as he has said, "I want all the money we can get out of the operation of the canal." He further stated that the fortifications on the Atlantic side of the canal are about completed, and those on the Pacific side about two thirds finished.

Oil Cooking in the Navy.—In agreement with the Navy Department policy of using oil instead of coal, there have been installed on the "Pennsylvania" and on Battleship 39, oil ranges for cooking purposes. In the matter of first cost there is a saving by the use of oil for cooking of about $8,500 for each ship and in operation the economy is much more marked. The question of the economy of operation in the galley is quite important. Thus the batch of bread alone baked each day for the crew of a modern dreadnought calls for the use of about six barrels of flour. The relative costs of cooking by the different methods have been found to be as follows per day: Electric range, $22.50; coal range, $16.00; oil range, $5.65. When in addition to the economy, the cleanliness and absence of ashes is considered, the advantage of cooking by oil on a ship which burns oil only in its main boilers is readily apparent.

Electricity

Submarine Power Cable.—The much-discussed project of an under-sea power line from Sweden to Denmark appears to be on the way to execution, for according to recent reports the two countries have now authorized the laying of the cables, and the work is to be soon begun. The object of the scheme is to make use of water power in the southern part of Sweden, employing the fall of the Lagan' River, and to bring this power by under-sea cable to the island of Zeeland, where it can be employed to advantage.

Wireless Telephony.—An Italian engineer, Signor Marzi, has invented a new microphone for use in wireless telephony, so that from Eiffel Tower in Paris it is now possible to hear concerts taking place in Brussels, a distance of about 225 miles. The singing could be distinctly heard, although it was not possible to make out the words of the songs. The well-known musical airs, the "Marseillaise" and the "Brabançonne," were recognized when they were being played on a gramophone 60 miles from Brussels.

Wireless Research Committee.—Under the auspices of the International Wireless Scientific Commission, there has been founded a French scientific committee, whose aim is to originate and facilitate this class of work in France and colonies, first relating to wave propagation; second, measurements in wireless work; third, study of various problems. The committee will be specially occupied with organizing researches which are proposed by the international commission. Seven to eleven active members form this body, with numerous corresponding members, and funds are to come from subsidies or donations. Prof. Branly is honorary president, and M. Blondel active president, while the list includes prominent men such as Abraham, Ferrié, Bethenod and Tissot.

Recording Radio-Telegrams with the Telegraphone.—M. Dosne has invented a method for recording radio-telegrams. He first substitutes for the telephone receiver of wireless telegraphy a sound amplifier and then connects this with the "receiver" of a Poulsen telegraphone. In this manner the microphonic current serving to convey the reinforced sounds arrives with all its variations to a bobbin of fine wire in the center of which is a pen of soft iron in contact with a rotating plate or traveling band of steel. The variations in the magnetization of the soft iron pen leave a sort of magnetic writing on the steel plate which has the property, when it is afterward passed under the iron pen which wrote it, of provoking a repetition of the original signals in the connected telephones.

New Haven Electrification.—Electrification of the New York, New Haven and Hartford Railroad between New York and New Haven will be completed probably by June 1st, as far as the overhead contact and distribution system is concerned. This will provide a continuous electrification of seventy-six miles, of which twelve miles, from Grand Central Station to Woodlawn, belongs to the New York Central. The extent to which the trains will be operated by electricity after that date will depend upon the output of current from the Cos Cob power station. The Cos Cob power plant has been extended to permit of a very large percentage of complete electric service; but it will not permit of a hundred per cent of electric service until power plants have been constructed at the eastern and western extremities of the electrification zone. Owing to heavy expenditures it has been necessary to forego the building of these additional power plants, so that complete electric operation will be delayed for an indefinite period, depending upon the general financial condition of the company and the country.

Berlin's High-Tension Service.—The Berlin central stations have been engaged, during the past, in supplying three-phase current at 6,000 volts or at 220 volts to several localities in the suburbs of towns, but within a recent date there has been made quite an extension in the electric supply system, as the plants decided to furnish current throughout quite a wide region in the surburbs. But the pressure of 6000 volts which was hitherto employed was found to be insufficient for the proposed longer lines, and this led to the adoption of a new standard of 30,000 volts for such work. A special network of underground cables was accordingly laid throughout the suburbs. Upon the new plan, three-phase current is furnished by the city station of Oberspree at 30,000 volts. Six cables start from this plant in order to make up two lines of three cables each, and one of these lines covers the northern section of the region, while the other takes in the south. Each line then subdivides into a certain number of sections, in the centers of which there are erected transformer posts in order to afford a step-down from 30,000 volts to 6,000 volts. At this latter voltage, the current is brought to the different localities and is then further transformed from 6,000 to the standard voltage of 220 volts, such as is needed for consumers' use. It is to be noted that underground cables are used for the 6,000-volt as well as the 220-volt lines.

Science

The Solar Eclipse of August 21st.—In the SCIENTIFIC AMERICAN of April 4th, it was stated that an eclipse of the sun would occur on April 21st. This was of course a typographical error, as the next eclipse of the sun will occur on August 21st. All the matter relating to the next solar eclipse is contained in the American Ephemeris and Nautical Almanac for 1914, and, with the omission of the Besselian Constants, in the American Nautical Almanac.

Within One Degree of Absolute Zero.—In a recent lecture, Kamerlingh Onnes, who has been awarded the Nobel prize for physics, remarked that we can now obtain, experimentally, a temperature which is only removed from the absolute zero of temperature by one degree. The temperature thus obtained is lower by two or three degrees than the temperature of sidereal space, which, according to the calculations of the astrophysicists, is about four degrees above absolute zero.

Statistics of the Nobel Prizes.—From 1901 to 1913, sixty Nobel prizes have been awarded. If we class the prizes by countries, comparing the populations, we see that the most favored countries are the three Scandinavian countries: Sweden, Norway and Denmark, which is significant in view of the nationality of the Jury. Then come Holland; France with 14 prizes and 39 millions of people; Germany with 18 prizes and 65 millions of people. After these come Switzerland, Belgium and England. Finally the United States and Russia have each received only one prize.

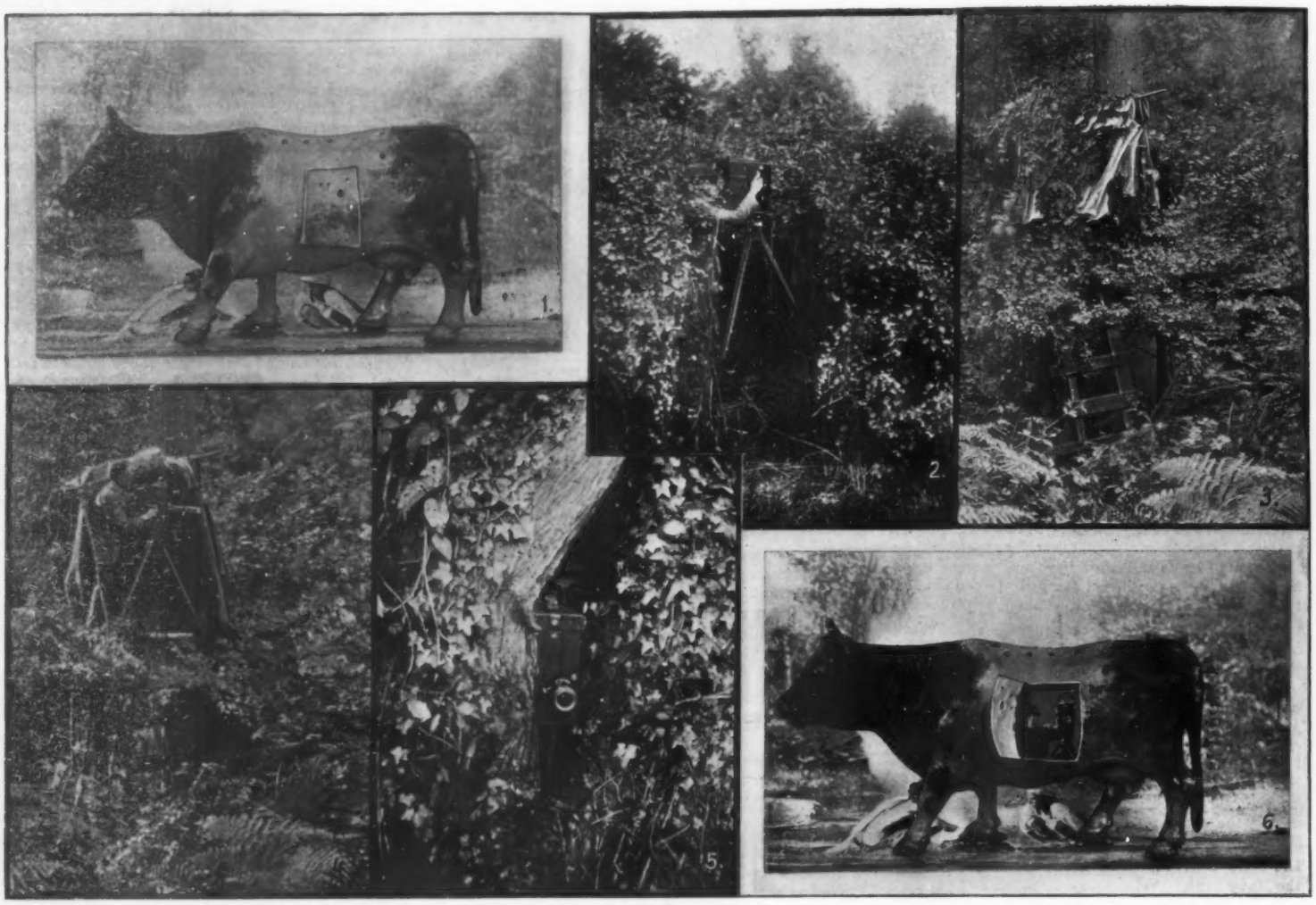
Vacuum Tar.—By distilling coal under a vacuum of 15 millimeters of mercury, Pictet and Bouvier obtain what they style "vacuum tar," this appearing to be quite different from usual coal tar. Such tar contains no phenol or aromatic carbides, and when oxidized by permanganate, there are produced acids of the fatty series. The properties of this tar resemble those of Caucasus petroleum, especially constituted by hydro-aromatic carbides. These experiments tend to confirm the hypotheses advanced by Berthelot and others as to the formation of the constituents of tar.

An International Journal of Vulcanology.—In this age of specialization it is anomalous that the periodical literature relating to volcanoes has heretofore been scattered through a great number of geographical and geological journals, owing to the lack of a journal devoted especially to vulcanology. Such a publication has now been founded, under the title *Zeitschrift für Vulkanoligie*, by Dr. Immanuel Friedländer, of Naples, and is issued by D. Reimer, in Berlin. It will contain memoirs, abstracts, notes, etc., in German, Italian, French, and English.

Zoological Investigations in Panama.—An excellent opportunity of studying the fauna of the Gatun region of Panama has been afforded by the concentration of the animals in small areas, due to the flooding of the region traversed by the canal. Such investigations are also facilitated by the fact that rivers previously unnavigable can now be ascended for the purpose of collecting specimens. Accordingly Mr. George Shiras, 3rd, of Washington, the well-known photographer of wild animals, and Mr. H. E. Anthony, of the American Museum of Natural History, have visited this region; the former to take flash-lights and other photographs, and the latter to make collections.

The First Pure Radium Salts Prepared in America.—A chemical manufacturing company of Pittsburgh has just announced its manufacture and sale of the first pure radium salt produced in America. Of this amount 133 milligrammes of radium element in the form of anhydrous radium chloride has been sold. Since the price is steadily holding to $120,000 a gramme, this is a very respectable start for the new American industry. The salt was extracted from the Colorado carnotite deposits, which are considered by the United States Bureau of Mines to be the largest deposits of radium-bearing ores in the world.

The Criminal Type.—Dr. C. Goring is the author of an English Blue Book which contains much valuable criminological information. Following the suggestion of Dr. Griffiths, deputy medical officer of Parkhurst Prison, a large number of prisoners convicted of certain similar offenses were subjected to accurate measurements in order to ascertain whether these showed any deviation from what may be described as the normal type. This material has all been tabulated by Dr. Goring. Like most modern criminologists he makes short shrift of Lombroso's "criminal type." "No evidence has emerged confirming the existence of a physical criminal type such as Lombroso and his disciples have described. . . There is no such thing as a physical criminal type. . . There is no such thing as a mental criminal type." The eugenists will surely find much confirmation of their theories in Dr. Goring's book. "Family incidence of crime is not fortuitously distributed, it is not entirely independent of lineage; criminals do not occur equally in all families of the general community, but tend to be restricted to particular stocks or sections of the community; to those stocks tainted with criminal ancestry."



1. A giant papier-maché cow twelve feet high, with entrance closed. Used to get close to dangerous or wary animals. 2. Hedge cut for camera, making a natural "hide." The operator conceals himself as much as possible when filming hedgerow life. 3. A novel "hide" in a forest. Subterfuge is necessary to secure good pictures of birds in their natural surroundings. 4. The "hide" open, showing operator at work on a bird subject, with the camera fifteen feet above ground. 5. Camera and photographer inside a tree trunk. An ingenious shelter, in order to get close to a timid bird. 6. The novel artifice shown in Fig. 1. The entrance open, showing camera and operator.

Stalking wild life with the kinematograph.

Stalking Game With the Kinematograph

How the Film Has Educated Zoologists

By the English Correspondent of the SCIENTIFIC AMERICAN

NATURAL history films have shaken to the foundations many staunchly rooted beliefs concerning animal, bird, and insect life. Not so long ago a film was produced in England which aroused considerable discussion. It was unequivocally stamped as a fake, but the kinematographer was able to furnish such conclusive additional proof that the incidents portrayed upon his film were absolutely true to Nature, that he was able to silence his critics. The latter then, by pursuing independent investigations along similar lines, were able to ascertain for themselves that what the film illustrated was correct, and that the text books were in error.

In order to secure absolute realistic films it is imperative that the pictures should be taken in the field.

In order to prosecute this branch of the kinematographic art extreme ingenuity is imperative. The animals, reptiles, and birds are extremely wary and cunning, so that it is difficult to track them to their lairs. Even then inherent timidity has to be overcome so that the subject may be photographed unconsciously. In one instance an indefatigable worker spent eight weeks in a stream, immersed to the thighs, in his efforts to kinematograph a particularly chary waterfowl. The clicking of the mechanism proved the first stumbling block after an ingenious ambuscade fashioned from a floating tree bough had been established within a yard of the bird's nest. Every time the machine commenced to whirr the bird sporting in front of the camera took fright and scurried away. In order to overcome this obstacle the operator contrived a novel clockwork mechanism which emitted a noise similar to the moving picture camera, and this he set in motion in close proximity to the wildfowl's home, keeping it running continuously night and day. For the first few days the bird regarded the unwonted noise with intense suspicion, but gradually it became accustomed to the sound until at the end of a fortnight it took no notice of it whatever. Then the operator was able to proceed with his camera without frightening the bird, and as a result secured some pictures which aroused considerable interest, for the simple reason that it was the first occasion upon which this subject had been caught, while many of the incidents which he filmed were quite unknown even to the naturalist.

Hedgerow life is particularly exasperating because the smallest birds for the most part are exceptionally shy. One operator, in order to secure some pictures concerning one of the smallest of the feathered tribe, cut a passage through a thickset hedge, and by means of a specially contrived tripod, the length of which gave him command of the nest, he was able to film his subject in peace and quietness after he had calmed the bird's suspicions.

In another instance the operator contrived a huge dummy tree trunk with a small living apartment within. It was erected on the verge of a swamp where wild fowl gathered for the nesting season. The operator lives here for some six weeks, the apartment within being fitted up with a camp bedstead, stove, and culinary utensils. Movement to and from the "hide" had to be carried out very cautiously, since in this particular instance the birds under observation have the peculiar trait of forsaking their nests, when sitting, at the slightest signs of an interloper's approach.

Extreme patience is a virtue in kinematographing wild life. Climatic conditions create an important part in the quest, while there are the birds' natural foes to be considered. On more than one occasion a half-completed film has been ruined by a tragedy of Nature, so that the whole of the work has to be done again. This applies particularly to wild waterfowl. Water-rats appear to know virtually to the minute when an egg will hatch.

One natural history kinematographer, who makes a study of small feathered forest life, utilizes a somewhat elaborate apparatus. A substantial elevated platform is erected, approached by a ladder. Upon this raised platform a small framework covered by canvas is built to house the camera and the operator. But to mislead the denizens of the forest trees the whole is artfully concealed beneath a maze of branches which hide every vestige of the canvas tent, while the rounds and sides of the last are also entwined with creeping plants. In the contrivance of such hides, however, it has been found that the green growth covering the "plant" must be kept in a fresh condition. The bird detects withered trees quickly, and its suspicions are aroused.

But probably the most novel "artifice" ever contrived for stalking Nature is the cow that was designed for approaching wild animals in safety. This is made of *papier-maché*, and stands no less than 12 feet in height. The carcass is built of a substantial framework so as to withstand hard usage, the skin being represented by the *papier-maché* covering, colored and tinted according to Nature. Within the cow is a platform upon which the operator stands with his camera. Access to the interior of the dummy is afforded by a door in one flank, and through this the operator points his lens, the door being kept open while kinematographing is in progress. The height of the dummy enables the operator to stand erect and to run his instrument in comfort. The animal itself is mounted upon wheels so that it can be maneuvered into position. Should a study happen to observe the operator through the open door, safety is possible by closing the latter immediately, in which event the spring of the beast would be rendered abortive, although it is possible that the impetus of the leap might overturn the dummy, though this is improbable, because the feet of the artifice are heavily weighted.

By means of this device it is possible to approach such wild animals as lions, panthers, leopards, and hyenas in perfect safety. Curiously enough the objects under observation never appear to observe that the stature of the cow is decidedly abnormal. At all events, the operator who uses this dummy confessed to me that although he had approached a ferocious lion within ten feet, the animal never had evinced the slightest doubts concerning its genuine character, but had resumed his movements unconcerned.

The Problem of Our Navy

IX.—The Need of a Council of National Defense

By the Editor

What is needed is the institution of a powerful, broadly representative board, composed of members of the Navy, of the Legislature, and of the Executive, which would consider, from every point of view, this question of naval increase and all naval questions of whatsoever kind, and present its findings to Congress with all the definite governmental authority which such a board would carry.

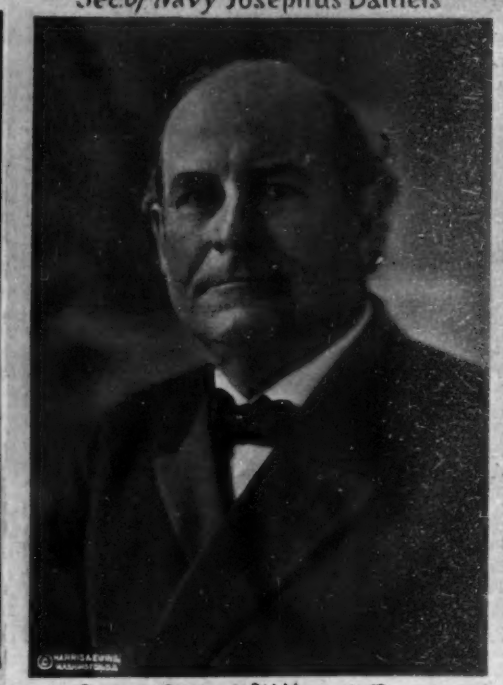
Illustrated by Photographs, Copyrights by Harris & Ewing.

Sec. of Treas. William McAdoo

Sec. of Navy Josephus Daniels

Sec. of War Lindley M. Garrison

President Woodrow Wilson



Sec. of State William J. Bryan

THE EXECUTIVE MEMBERS OF THE COUNCIL OF NATIONAL DEFENSE

OUR study of the problem of the United States Navy, as thus far developed, has revealed the following conditions:

I. The spirit of international aloofness in which the United States had worked out its destiny during the first century of its existence was dissipated by the unforeseen outcome of the Spanish war, whose successful military activities moved our frontiers a thousand miles eastward into the Atlantic and westward five thousand miles to the very doors of Asia. The country, so far from deploring the new conditions, not only frankly accepted them, but immediately proceeded, both in its diplomacy and by the increase of its naval and military forces, to make secure its position as a great world power. It reaffirmed, most strongly, the Monroe Doctrine, commenced to build and fortify the Panama Canal, boldly advocated and put through the policy of the Open Door in China, and became in the Pacific the leading exponent of the doctrine of Asiatic exclusion. Contemporaneously with this great enlargement of its foreign policies, the United States made haste to provide the means for their enforcement, building up its navy so rapidly, that, within half a dozen years, it had become the second naval power in the world.

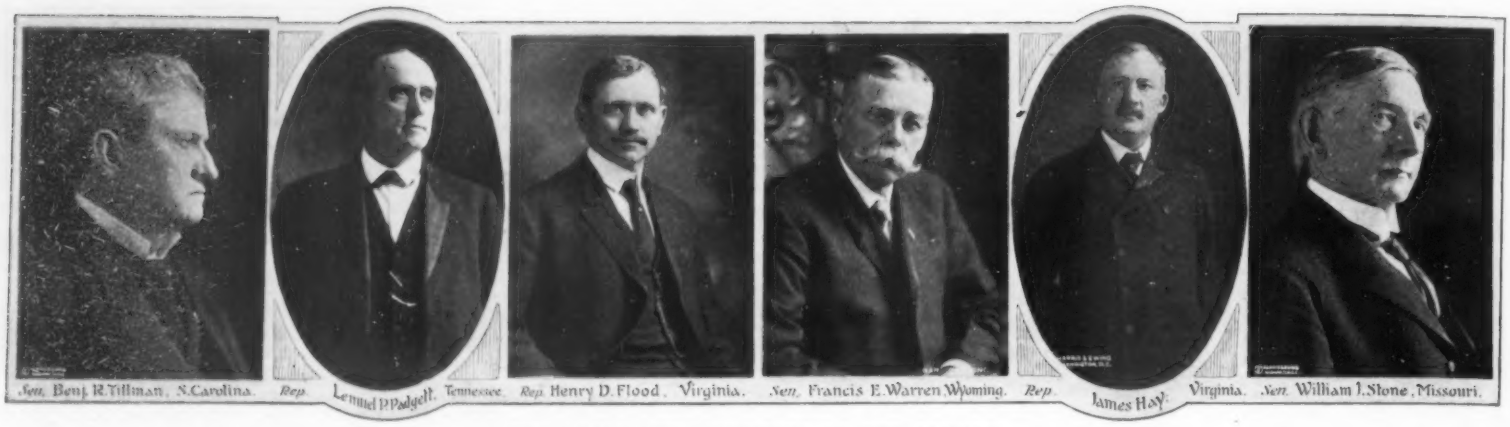
II. In the year 1905, when we had reached the zenith of our diplomatic influence and naval power, the appearance of the dreadnought produced a revolution in the rating of naval strength and threw our twenty-three first-class battleships into the second line. At this very time, when other nations began to accelerate their naval construction, building upon dreadnought lines, the United States, with that fatal lack of continuity of plan and purpose for which it has paid so dearly in years gone by, began to slacken its activities—the falling off being shown by the fact that whereas, from the Spanish war of 1898 to 1905, we had built an average of four armored ships per year, from 1905 to the present time, during the dreadnought era, we have built at the rate of only one and a half armored ships per year. As the result of this neglect, we have sunk to the position of a third rate naval power, there being one first rate power, Great Britain, with 42 dreadnoughts; one second rate power, Germany, with 26 dreadnoughts; and three third rate powers, the United States with 12, France with 11, and Japan with 10 dreadnoughts built and building.

III. The gravity of the present situation is aggravated by the fact that, during the period of decline of our navy in relative strength, we have asserted our ambitious foreign policies with a definiteness and in an uncompromising spirit, for which no parallel can be found in all the history of the republic.

IV. The failure of the people of the United States and their representatives in Congress to maintain a navy commensurate with the growing wealth of the country and the stupendous foreign policies to which it has so boldly committed itself, is due largely to the mistaken belief that the vast but undeveloped resources of the country, as regards both the men and of the materials of warfare, are a sufficient guarantee of peace—and this in spite of the fact that this very policy of unpreparedness has saddled the country with an annual pension roll of $180,000,000. Prudence demands that, as quickly as possible, our navy shall be restored to the position of second in rank which it held in 1905. To effect this our private and public shipbuilding yards should be employed to their fullest capacity, until our dreadnought line is sufficiently powerful to restore us to the second rank. The appropriation by Congress of a sum equal to that which has this year been appropriated for pensions, if spread over the next three years, would give us a first fighting line by the year 1920 which would be sufficient to preserve the peace by discouraging any conflict for the possession of the Caribbean and the control of the Panama Canal.

V. Contemporaneously with the upbuilding of our first fighting line, it should be the care of Congress to make good other most serious deficiencies in the navy. The interference with and neglect by Congress of the carefully-thought-out plans of its naval advisers has led to a situation, in which we find ourselves with only three scouts when we should have thirty; with only a little over one round of torpedoes for our torpedo tubes when we should have ten rounds; and with practically no mines or mining outfits. The serious nature of this deficiency is seen, when we bear in mind that the torpedo and the mine caused the loss of more ships in the Russo-Japanese war than were wrecked or sunk by gun fire.

VI. Although the fighting ships of the American Navy in their several classes are, date for date, fully equal to the best in the foreign navies, they are severely handicapped by the shortage in the personnel. Of the officers and the men themselves, it may be said that there are none more efficient in any of the navies of



THE LEGISLATIVE MEMBERS OF THE COUNCIL

the world. It is in quantity, not in quality, that the ships and their personnel are deficient. In the crisis of a suddenly precipitated war, it would be impossible to man even our first fighting line with its full complement of officers and men, without robbing the reserve fleet of that nucleus of a trained force which is necessary to render it efficient. Because of an obsolete method of promotion, our officers will reach command and flag rank long after they have passed that period of their lives when they would have been most efficient for the duties of these particular ranks. The remedy is to be found in a method of selection by which the most efficient officers will be chosen for promotion, those not selected being relegated to the reserve list and shore duty. To insure that the number of officers and men shall bear a strict relation to the number of ships in the fleet, the increase in the personnel should be made annually, and it should bear an exact proportion to the yearly increase of the fleet, as determined by Congress.

VII. No navy can be efficient if it is not possessed of a carefully-worked-out plan of mobilization. The lack of any such plan constitutes one of the greatest weaknesses of the United States Navy to-day. A perfected mobilization implies the possession of war plans to meet all possible conditions; a personnel sufficient to command the reserve ships and auxiliaries; a large reserve of ammunition, supplies, guns, torpedoes, and coal; a full list of suitable merchant ships assigned to various ports at which they can be transformed for auxiliary service, contracts made with the owners for chartering the ships, and the possession of plans and the materials for the quick conversion of these ships to war purposes; naval stations and bases fully supplied and equipped for rapidly executing the emergency work which would have to be done on a declaration of war; advance bases, with their outfits, materials, and men ready to be transported for duty with the least possible delay; and, finally, a trained naval reserve, composed of ex-enlisted men of the navy, from which the necessary forces may be speedily sent to the coast, for manning the reserves and auxiliaries.

The Cause of Our Unpreparedness.

From the foregoing it will be evident that, *although our ships and the officers and men who man them are absolutely first-class, our navy is in a chronic state of unpreparedness for war, and in saying this we wish to emphasize most strongly the fact that the blame for this unpreparedness is not to be laid upon the Navy Department.* All the defects which we have mentioned and others to which we have had no time or space to refer, have been long known and greatly deplored within the Department itself. Year after year our Naval Board, which is charged with the work of deciding what the strength and composition of the navy should be, has presented to Congress a carefully-thought-out plan or programme of construction and enlargement. And year by year the programmes have been cut down and mutilated; urgently needed reforms, calling for legislative action, have been refused; and, as a result, we find ourselves to-day with a navy that is not only inadequate in numbers and strength, but the various parts whereof bear no proper relation to each other or to the whole.

Upon whose shoulders then is the responsibility for these conditions to be placed? *It is chargeable to the people of the country at large and to their representatives in Congress. So far as the former are concerned, the neglect of the navy is due either to lack of understanding, or to indifference, or to both. So far as Congress is concerned, the neglect of the navy is due to politics and the disposition of Congressmen to place local considerations and personal ambitions above questions of prime national importance.*

So far as the public is concerned, the ignorance as to the purpose and meaning of the navy can be removed only by the institution of a systematic course of instruction. This should begin in the public and high schools, whose curriculum should include the mastery of a simple primer on political economy, one chapter at least of which should be devoted to the naval and military forces of the country, in which it should be shown why these are necessary and in what proportions. If this were done, the youth of the country would grow up with the conviction that an adequate army and navy is as necessary to the national well being as the provision of a currency and a banking system.

They would understand that the primary purpose of their country's naval and military forces is the same as that of a police force—the protection of the lives and property of the citizens. They would understand that the object of an army and navy is essentially pacific—that it aims to preserve the peace, not to stir up war. They would understand that, just as the 5,000,000 citizens of a great municipality like New York can go about their daily labors and sleep securely in their beds at night, only because of the strength and vigilance of a police force of 10,000 men, so the 100,000,000 citizens of this great country, its enormous wealth, and its far-reaching international interests, can be rendered secure, only so long as the country possesses an army and navy adequate for their protection.

With such tuition in the schools, the youth of the country will pass on into the broader knowledge of full manhood, with a clean-cut understanding of the need, not only for a navy, but for a navy measuring up to its multitudinous responsibilities.

The work of the schools in promoting right thinking might be, and certainly should be, supplemented by the intelligent criticism of the press. To-day such criticism is altogether too one-sided. It deals too largely in superlative approval, and tends to keep alive that feeling of national invincibility, based upon the successes of a hundred years ago, which has much to do with the present indifference to the navy, or rather indifference to the need for its enlargement. In Germany they do these things better. The children in the public schools, and the public at large through the press, have been so well instructed that they understand perfectly well what is the policy of the Government in naval affairs. Hence, the German people, by a very large majority, are thoroughly in sympathy with the naval programme. It should be so with us, and *if every important daily paper and weekly and monthly magazine maintained on its staff a naval expert, who was at all times closely in touch with the naval situation, and whose duty it was to record the absolute truth, failures as well as successes, the people of this country would have such an intelligent and sympathetic understanding of the problem, that the cheap diatribes of a Senator Burton, with his sneers at the "paid idleness" of the navy, would be received with the amused contempt which they deserve.*

So far as the relation of the Government to the navy is concerned, the present unsatisfactory conditions which have led to the decline of the navy in a few years' time to the third rank, are due chiefly to the lack of proper and intelligent co-ordination between the Executive as represented by the President and his Cabinet, the Legislature as represented by the two houses of Congress, and the Navy Department as represented by the technical advisers of the Secretary.

As matters now stand, the technical advisers as represented by the Navy Board draw up every year a programme of construction, representing the minimum requirements. This is presented to the Secretary, who, more often than not, makes a considerable reduction in the number of vessels asked for. The emasculated programme then goes over to the House, where it is subjected to more or less hostile criticism by the House Naval Committee, and by the time it is framed up into a bill, the programme usually has suffered further depletion. Then comes the debate on the bill in the House

THE ARMY AND NAVY MEMBERS OF THE COUNCIL

of Representatives and the usual fight between the so-called "big navy" and "little navy" factions. Too often the arguments against the granting of what little is left of the original minimum requirements of the navy, as decided by its technical advisers, are presented by men who have never given that thoughtful consideration to the subject which its importance demands. Local politics and party politics, which surely should have nothing whatever to do with a subject affecting the very existence of the nation, enter largely into these discussions. The vital issues, such as the relation of the navy to the national policies of the country, seem to be totally lost sight of. The attitude, both in the committees and on the floor of the House and the Senate, would sometimes seem to be one of positive hostility. Too often the suggestions of the Naval Board are treated as though they were requests for something of a personal or privileged character—as though the officers of the navy were trying to get from Congress something which would be for their own benefit.

A Council of National Defense.

What is needed is the institution of a powerful, broadly representative board, composed of members of the navy, of the legislature and of the executive, which would consider, from every point of view, this question of naval increase and all naval questions of whatsoever kind, and present its findings to Congress with all the definite governmental authority which such a board would carry.

With this object in view there is a bill before Congress for establishing what is to be known as "A Council of National Defense." We alone, among the leading powers, are without any such Council, and it is our belief that the present unsatisfactory condition of our naval and military forces is due very largely to the lack of such a body.

It has been said truly by one of our leading naval authorities, that "at present it seems to be the popular idea that the statesmen are in control up to and including the time that the solution of difficulties between nations is impossible except by resort to arms; that after that they call in the naval and military forces to cut the Gordian knot which they have been unable to disentangle, and that the making of war has little connection with the cause of war."

As matters now stand there is a lack of co-ordination, or perhaps it would be nearer the truth to say, a lack of proper means for co-ordination between the Executive, the Legislature, and the Naval and Military Departments; and the object of the creation of a Council of National Defense is to provide the proper means for this co-ordination, not merely at the threat of war or during its continuance, but permanently. If such a Council were in existence, its recommendations to Congress would be free from any suspicion of partisanship or individual departmental influence. It would be authoritative in the highest degree, and it would represent the matured opinion of the Government as a whole.

Such a Council would consist of the President of the United States, who would be *ex-officio* president of the Council, and the Secretary of State, who would preside in the absence of the President. Through the Secretary of State would be represented those broad policies of the nation to which reference has been made so frequently in the present series of articles. It would be the duty of the Secretary to keep the Council informed as to changes and extensions of our policies. Because of his intimate knowledge of the diplomatic situation, he would be able to give early forewarning of the direction from which possible complications might come. For similar reasons, the Council would include the chairman of the Committee on Foreign Relations, both of the House and of the Senate. The financial side of the problem would be represented by the Secretary of the Treasury. Technical information as to the naval and military forces which would be necessary to maintain our policies would be afforded, for the army by the Secretary, the Chief of Staff, and the president of the Army War College, and for the navy by the Secretary, the Naval Aid for Operations, and the president of the Naval War College. The legislative side would be further represented by the chairmen of the House and Senate Naval and Military Committees.

In such a Council of National Defense, the nation would possess a body of men, who, because they were in possession of full knowledge on every side of the great questions involved, would be able to discuss the matter of national defense with intelligence and authority. The plans and operations of the army and navy would be thoroughly co-ordinated, and the upbuilding and maintenance and effective use of our naval and military forces would be conducted on the highest plane of efficiency.

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At the present writing the American fleet is steaming to a Mexican port to enforce the demand of the President for a salute of twenty-one guns as an apology for an insult to the American flag.

The crisis thus precipitated may bring the apology demanded—or war.

Herein is presented an object lesson on the facts and principles upon which we have dwelt in the present series of articles on "The Problem of Our Navy"—a confirmation of the need of this country's possessing a navy for the swift enforcement of its policies.

To convince the American people that we need, not only a navy, but a navy adequate to meet all possible conditions, we ask: "If the arrest of our sailors had occurred at Kiel, would Admiral Mayo have sent his ultimatum, and would our fleet be now converging on that port in its full strength?"

The Man at the Switchboard

By Henry Harrison Suplee

IT is one of the greatest claims of applied science to recognition that it is continually acting to liberate mankind from the burden of physical labor, by substituting manufactured power for the effort of muscular energy. The workman of to-day, in very many instances, uses his head far more than his hands, directing and controlling forces generated, transmitted, distributed, and applied with a minimum of exertion.

Formerly the great workshop contained an "army" of laborers, and in many cases this is yet the fact, but the proportion of men to the output is growing continually smaller, and in certain departments of industry, notably in the iron and steel manufacture, and even more in the great power houses, the small number of men, compared with conditions a few decades ago, is remarkable.

The layman, visiting the power-generating station of some important transportation system, such as that of the New York subway, or the Brooklyn Rapid Transit system, is impressed with an almost uncanny feeling that all this powerful machinery is running itself.

It is true that a few men are seen moving quietly about, but these are apparently engaged rather in watching the smoothly running engines and purring dynamos, than in any way exerting themselves to produce any immediate results. Outside, coal is being raised from barges by the edge of the river and delivered automatically to bins in the upper portions of the great building. Within, there is a quiet flow of fuel downward from these same bins into the hoppers of automatic stokers beneath long batteries of steam boilers. The grimy coal passers and perspiring stokers of the old-time boiler house are nowhere to be seen, and in their places there are a few quiet, clean men, with keen, intelligent faces, making an occasional adjustment, or glancing through an inconspicuous peephole.

Beneath the boilers the cinders and ash are being cleared away by conveyors and delivered directly to the cars by which they are removed; no back-breaking shoveling is visible anywhere. Dust, dirt, cinders, all are conspicuous by their absence, and a modern boiler room is cleaner than an old-time machine shop. The engine room, if we may use such a commonplace term to describe the magnificent hall in which the energy liberated from the burned coal is transformed through the medium of expanding steam into mechanical power and on into electrical current, is almost as bare of human occupants as was the boiler room. By careful examination a few men may be seen passing from one machine to another, not working at all in the former meaning of the term, but showing scarcely more than a casual interest, so far as the ordinary visitor might observe. The windows of the great room are bright and free from dust; the mosaic floor might well be the entrance to some modern hotel or museum; the polished hand rail might belong to the companionway of the latest floating palace of the north Atlantic. Overhead, just beneath the chords of the trusses which support the roof and permit the space beneath to be clear of pillars or other supports, may be seen the deep girders of a powerful traveling crane, deriving its power by the consumption of a trifling portion of the current generated by the whirling rotors beneath, and ready at any moment to lift anything, from a few pounds to many tons and deliver its burden anywhere on the floor below. When it is needed its full power may be directed by the effort of one man with less exertion of the wrist than is required of a player on the violin. There is no need for a gang of laborers here.

The commander of a great ocean liner has his station upon the "bridge," whence he may see all and direct everything. The commander of the great power station has also his bridge, but he needs no lookouts to signal to him, he has no need to peer through some enveloping fog to discover the approaching iceberg. The man at the switchboard has before him the quivering needles of sensitive instruments, keeping him apprised of the condition of all that is going on throughout the highly organized system committed to his care, not only within the power house, but out upon the line, and throughout the whole combination of mechanism and forces. He has no need to work hard with his hands, the control is dependent, not upon physical effort, but upon directive movements easily made and immediately effective. The switchboard is the brain of the entire system, directing the energy of the station both within the limits of the building and without, so far as the lines extend.

In such a power station we may find 100,000 horsepower generated, directed, and controlled by a force of fewer than 100 men, and these are none of them working with any serious physical effort, but using their trained minds and skilled hands to the production of far more value than could possibly be conceived under the old idea of productive labor.

When Tredgold formulated his famous definition of the work of the engineer as the "art of *directing* the great sources of power in Nature to the use and convenience of man," it is hard to believe that he did not have before him some revelation of the man at the switchboard in the modern power house.

Fatal Industrial Accidents in Massachusetts

AN interesting table, printed below, has been prepared by the Industrial Accident Board of Massachusetts to show the causes of fatal accidents reported to the commission in its recently concluded first year of existence. The total number of non-fatal accidents in the State was 89,694, or about one for every ten wage-workers. The board is of the opinion that at least half of these can be prevented through improved inspection methods, by safeguarding machines before they leave the factory, by the maintenance of safety museums, through lectures, moving pictures, school talks and the elimination of danger spots in plants. There were 474 fatal accidents, classified as follows:

Railroad equipment	119	Machinery peculiar to special industries	7
Falls	66	Belting	6
Vehicles	43	Infection from trivial cuts, burns, etc.	5
Hand labor	37	Saws	4
Elevators	33	Explosions (not boiler)	4
Electricity	25	Hoists	4
Street Railways	20	Illness	3
Boiler explosions and burns	15	Presses	2
Excavating	14	Gears	2
Cranes	11	Emery wheels	2
Miscellaneous	11	Occupational diseases	2
Asphyxiation, drowning, etc.	10	Glass	1
Animals, insects, etc.	9	Wood molders	1
Shafting, set screws, etc.	9	Assault and fighting	1
Falling material	8	Total	474

Atmospheric Electricity and Plants

A COMMON experiment to demonstrate the supposed stimulating effect of atmospheric electricity upon the growth of plants consists in covering certain plants with a metallic cage, when it is found that their development is retarded as compared with that of plants not similarly treated, the assumption being that the insulation of the plants from atmospheric electricity accounts for the difference. As experiments of this character have been prominent in the history of electroculture, much interest attaches to observations recently made by P. Lesage on the growth of species of cress and of *Datura tatula*. Plants were grown under a wire cage, as above mentioned, and also under a silk cage of exactly similar dimensions. At the end of three months it was found that the plants under the two cages had been retarded in growth to the same extent, as compared with plants grown in the open air. This result eliminates atmospheric electricity from the problem, and some other factor must be sought. It is found in the obstruction offered by both cages to evaporation. The rate was decreased by the cages 10 per cent in still air and about 30 per cent in moving air.

The Current Supplement

AN article "Machine Tools and the Motor Car Industry" in this week's SCIENTIFIC AMERICAN SUPPLEMENT describes several interesting machines used in the manufacture of automobiles.—B. J. Newman, writing on colossal waste, due to bad municipal engineering, shows how a false economy in dwelling space is paid for by the sacrifice of countless human lives.—Sir Joseph J. Thomson has recently delivered a course of lectures on Recent Advances in Physical Science. The first of these, which appears in this issue, is devoted to a new theory of chemical affinity, which seems destined to solve many problems of long standing and fundamental importance.—Alexander Del Mar contributes an article on the evolution of the breech loader.—C. H. Claudy gives an illustrated discussion of the practical problem of taking a snapshot photograph at the exact moment when a moving object, such as a tennis ball, reaches a particular position, e. g., just as it takes the racket.—Dr. O. Damm writes on blood pigment and chlorophyll in the light of modern investigation.—The principal exhibits at the Olympia Aero Show (London) are illustrated and described.

Some Interesting Wiles of the Art Faker

How Patinas Are Produced to Fool the Unwary, How Old Wooden Carvings Are Produced That Would Deceive Even the Craftsman of the Middle Ages, and How the Work of the Old Potters is Reproduced for the Antique Market

By the Paris Correspondent of the SCIENTIFIC AMERICAN

A genuine piece of Korean pottery of the XVI century.

Imitation XVI century Korean pottery made in France.

A Virgin Mary carved in old wood, painted, cleaned with alkali, and finally repainted. Plaster scalings have been used to heighten the deception.

An Egyptian statuette made by taking a cast from an original. The joint between the two halves is visible. An artificial coat of verdigris has been given to the object. A healthy industry in making such "antiques" thrives in Egypt.

A false keystone of modern manufacture, which has been so admirably aged that it is almost sure to deceive the enthusiastic lover of antiques. Only one familiar with methods of faking could discover the fraud.

A false Tanagra figurine made of plaster and cleverly painted. Because Tanagra figurines are in great demand there is a flourishing European industry supplying the market.

M. EMILE-BAYARD, inspector in the Ministry of Beaux-Arts, has recently published an interesting book on the "Art of Detecting Fraud," which reveals many of the technical methods employed by dealers in fraudulent antiquities. Since Americans are large buyers of old art objects, the following excerpts from his valuable work may prove helpful.

For making imitations of ancient sculpture in wood, especially of the middle ages, which were often painted, there are employed either single pieces of heavy timber or an assemblage in the case of very large work. Several pieces are assembled by the use of glue, old rusty nails or wood pins. The appearance of a painted statue is often imitated, and in this case the statue is first painted, and when dry the paint is removed, for the most part by caustic potash. Traces of color which remain in the veins of the wood or in hollow places serve to give the illusion of a statue whose color has faded, an effect which is heightened by touching up the object with gold here and there. This kind of fraud easily passes muster, for the seller of the object tells how he found it in a remote country place, and much covered with dirt, so that in order to clean it at all he was obliged take the color off with alkali. Aging of wood is often done by leaving it in a bath of acid, and when thus treated, the soft parts of the wood sink, and the fibers become prominent. Thus the appearance of age is imparted.

In treating wood in order to give it the appearance of age a warm tone is obtained by the use of walnut stain more or less diluted, depending on whether merely a mellow tone or a distinct brown color is to be obtained, then giving a wax polish by a cloth or soft brush. Unpainted wooden statues are oftenest treated in this way, and a brilliant finish is the result. The hollows are neatly filled with dust, and clumsy and evident repairs are often made in order to attract attention, and make it appear more certain that the piece is genuine. However, time gives to old wood a velvet finish which is inimitable, and by a little practice one can detect this by passing the hand over the surface. Attempts are made to imitate this finish by beating the objects, especially if they are of oak, with a thong or even something harder to reduce the angles and to close up the fibers of the wood, also to produce the effects of injury, knocks, and all the usage of time. But neither these methods, nor the patient use of sandpaper and wax polish, will give to a full degree the polish possessed by old wood, although the inexperienced fail to see the difference.

The use of the saw was unknown in old days. The hatchet was in favor. Any grooves or marks due to a circular or band saw can at once be detected, and as wood was not economized in those days, thin wood should be suspected. Old wood was assembled with wood pins as a general rule, and was not glued and rarely nailed. It is often stated that worm holes are made in wood by firing small shot into it, but that may be doubted. Worm holes can easily be made by suitable tools. Wood can be rotted by burying it in the ground, then watering the ground with acid, although the process is limited, of course, to small pieces, either of wood, stone, or metal.

A supposedly old ivory carving which has deceived a connoisseur.

Patina upon copper is produced in various ways, one of these being a treatment with sulphur vapors, which often gives agreeable iris hues. Oxidation is produced by the use of a mixture of salt and ammonia, the metal being also attacked if need be by acids such as hydrochloric or sulphuric. Metal surfaces are aged by a mixture of lampblack and turpentine, which collects in the hollows of the relief, but a more permanent treatment consists in first applying a coat of black varnish and then rubbing up the metal so as to leave the black parts only in the hollows. A patina is given to tin simply by rubbing it with garlic, or, in other cases, by the use of lampblack, but more striking effects are produced with antimony butter, more or less diluted with water, according to the degree of aging desired. Gold and silver are easily aged by applying bisulphide of carbon.

Another class of work frequently employed on metal objects is that of "embellishing" copper and pewter mugs and pitchers. Plates and the like are given extra ornaments either by *repoussé* or by engraving, so as to be much enriched. Such frauds are difficult to detect, for the object as a whole is authentic. But the added features can often be detected by examining the freshness of the cutting and tool strokes, also the color of the patina. A lack of taste in such ornaments is often evident. As regards silverware, the hall-marks or other goldsmith's marks are now imitated upon goblets or teapots, or ornaments are often added to authentic pieces. In some cases a vessel is made authentic to all appearances by using simply a real bottom piece bearing the hall-mark, and fixing it to a new vessel so that the whole appears to be ancient. Making new pieces by molding is a frequent practice, but here the hall-mark being molded and not punched is much less sharp, and the process can be detected. Great numbers of pieces are made by molding. Thus spoons are transformed into forks which are most needed in silver services, without touching the hall-mark.

Ancient coins and medals are of course the easiest to imitate, and they are produced in quantities by electrotypers and die workers. By the galvanoplastic process an ancient medal can be reproduced with ease, and it only remains to put on a patina, to gild, oxidize,

age with varnish, and the like. Another plan is to saw medals in two and use the most attractive halves, which are then brazed or soldered together. Letters or any kind of signs can be added to increase the interest of the piece, suppressing useless letters by filing them off, and in their place the new letters or signs are struck on by the use of dies. Other practices are to dip the coin in an acid which attacks the relief and changes its appearance, making it more difficult to identify frauds. For all that, the fraud can sometimes be detected, for in the first place the ancient medals were coined and not molded. Attention should be given to mold joints, which are unmistakable signs of spuriousness. In assembling pieces, the harmony of the letters on obverse and reverse should be noticed, also the unity of the field and the border, and the patina. Weighing two medals in the hand, one coined and the other molded, for equal size the cast medal is a little heavier than the other. Filing of the mold edge can often be detected in such work. As to false patina, verdigris will hardly resist the action of lemon juice, which bares the copper, and boiling water removes any varnish or other aging substances, while the real patina given by time will stand the test.

The great demand for ancient armor, which is so largely used for decorative purposes, for instance in panoplies, has given rise to a correspondingly abundant supply, consisting of shields, swords, daggers, battle-axes, and the like. It should be remembered that armor and weapons are, of course, of steel and are forged, the metal being worked by the hammer and also embossed, and each piece is assembled by riveting. If the specimens are made of iron and not steel, the fraud is apparent at once, and all pieces obtained by casting are, of course, false. Soldering or brazing was not employed at that time, at least in the great majority of cases. To increase its strength and flexibility, ancient armor was made of two pieces of sheet, fire softened and beaten together so as to weld them. Ancient helmets are made of one piece, and only the visors are added. Patina is given to iron by burying it for rusting or by sprinkling it with water or acids. Exposure to weather is also resorted to, or else the piece is dipped in hydrochloric acid. In these different ways there are obtained alterations which give the appearance of age. Genuine black patina is imitated by a proper use of black varnish, which is then almost entirely rubbed off, and for imitation antique glaives in bronze, verdigris is produced by means of salt, moistened with vinegar or lemon juice. Friction upon metal, or sandpaper, is the enemy of such surface patina. Black rust is, however, often used to conceal soldering or brazing which would otherwise be visible.

The remarkable polish of ancient arms is imitated by patient rubbing with a soft cloth wet with encaustic wax prepared with gasoline (floor-wax), but an experienced eye can readily distinguish between such polish and the real one seen upon ancient steel arms. Damaskeening of arms and armor is imitated or rather supplanted by a process which is easier to carry out. In the real work, grooves are engraved in the metal by tool and then gold or silver wire is laid in; but in the other case the design is simply etched out by acids and gold in fragments or gold leaf is put in and hammered, then filed off to the level of the surface. It is easy to detect by lifting the end of the gold wire by a pointed tool, so as to draw out the continuous wire from the whole design, while in the second case only metal fragments are found. A ready imitation is to gild or silver the whole surface by the use of the plating bath, then protecting the design by varnish and dissolving off the rest of the metal, finishing by a few retouches with the chisel to complete the illusion.

To detect frauds in ceramics is most difficult. Well known potteries often imitated one another's pieces. For instance, the Rouen products were copied at Quimper, Lille, Nevers in France, and also at Anspach and Pavia, while the Nevers works imitated the Italian products from Savona, Urbino, and Faenza, and so on, so that all is confusion. Even the experts cannot find their way. Counterfeits of Bernard Palissy can be detected by noticing marks of the potter's wheel, for the real pieces were shaped by hand, being also reproduced in small number by molding. Tanagra statuettes are as innumerable as Roman lamps, but the former, at least, may rather be called reproductions, for anyone at all familiar with museum specimens can detect them on sight, that is, the ones which are commonly sold cheap, and which are made of plaster and modeled upon a frame backing, then painted and coated with a grainy material, with traces of color or gilding. The real Tanagras were made from molds, and the fineness of their details has rarely been imitated.

Old ivory boxes, statuettes, Gothic diptics, crucifixes, handles of arms, are now produced in great quantities to meet with the demand. Special composition material or modern ivory is employed, with a suitable patina to imitate age. Cracks are made by dipping in boiling water and holding to hot fire, thus producing expansion and cracking, and a mellow hue is given by fumigations of tobacco, tanbark or wet hay. A bath of ocher, rubbing with turpentine and Judaea bitumen, licorice juice or lampblack, are all employed. Round shapes can often be detected by noticing the circular marks of the lathe, for instance on a box bottom, and various patinas can be washed off with alcohol or even water. Celluloid is sometimes employed for this purpose.

Some remarkable imitation antiques.

Antarctic Meteorology

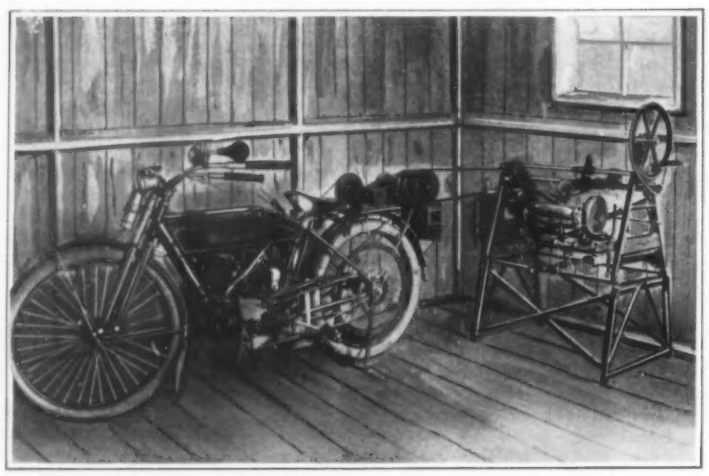
THE meteorology of the Antarctic was altogether enigmatical a little over a decade ago. To-day the observations of the numerous recent expeditions are beginning to make clear its principal features, though much work in this line remains to be done. The most comprehensive summary of the subject is that published by Prof. W. Meinardus in the January number of the *Geographische Zeitschrift*. Series of meteorological observations have now been made at three fixed stations in West Antarctica (the Swedish station at Snow Hill, 1902-03; French station at Port Charcot, 1904-05; French station on Petermann Island, 1909), and at five in East Antarctica ("Southern Cross" station at Cape Adare, 1899-1900; "Gauss" station, Kaiser Wilhelm Land, 1902-03; English stations at MacMurdo Sound, 1902-04, 1908-09, and 1911-13; Norwegian station "Framheim," 1912-13; Australian station in Adélie Land, 1912-14). All of these lie on the coast, the most southerly being "Framheim," which was over 800 miles from the pole. From the interior we have only the relatively unsatisfactory observations made by sledging parties. To a third class belong the observations made on vessels drifting slowly in the ice, as in the "Belgica," "Scotia," and "Deutschland" expeditions. Lastly, some of the latest Antarctic expeditions have secured numerous observations of the upper air with the aid of kites and balloons. The most remarkable series of such observations was that made by Lieut. Filchner's meteorologist, Dr. Barkow, who carried out no less than 255 flights on 209 days during the ice-drift of the expedition in Weddell Sea. On one occasion a pilot-balloon was sent to an estimated altitude of 56,430 feet, or about 10.7 miles. Much knowledge of the upper air currents has also been obtained from observations of clouds. The Antarctic has surprisingly cold summers. Roughly speaking, the warmest month in the year has a mean temperature of 32 deg. Fahr. (the freezing-point) or below everywhere inside the Antarctic Circle, in spite of the continuous sunshine of that season; while in the neighborhood of the pole at the same season the temperature may fall to about 60 deg. below zero Fahr.; an intensity of cold that can hardly be explained merely by the altitude of the Antarctic plateau, great as this is. The winter temperatures (April to September) are remarkably uniform; there is no month of decidedly lowest temperature as in the Arctic. At Framheim was recorded the lowest average yearly temperature heretofore found anywhere in the world; viz., 13.4 deg. below zero Fahr. Prof. Meinardus advances a novel and interesting theory of the atmospheric circulation in the Antarctic. Between latitude 60 and 70 a trough of low barometric pressure runs around the globe; south of this the pressure rises, forming the polar anticyclone. The strong easterly winds of the Antarctic coast he believes to be fed by air brought from lower latitudes by the cyclonic circulation. This explains why they are not dry winds, as they would be if they came from the interior of the continent and belonged to the anticyclonic circulation. Lastly, the polar anticyclone is a shallow one, and in the interior does not even extend as high as the land itself. Above it lies a polar cyclone, which draws in air from the north. This air comes from a vast oceanic region, and its moisture feeds the great continental glacier under which Antarctica lies buried, making good the loss due to evaporation and to the flow of glacier-ice into the sea.

The 100-inch Telescope

THE vicissitudes attending the task of building a 100-inch reflector—by far the largest telescope in the world—for the Mount Wilson Solar Observatory have been watched with interest and anxiety by astronomers for nearly eight years. At last the successful grinding of the great mirror is so far assured that active work has been begun on the construction of the mounting and dome. Foundations have been laid for the observatory building, and the telescope pier is about finished. The latter measures 20 by 45 feet at the ground-level and is 33 feet in height.

Driving Machine Tools With a Motorcycle

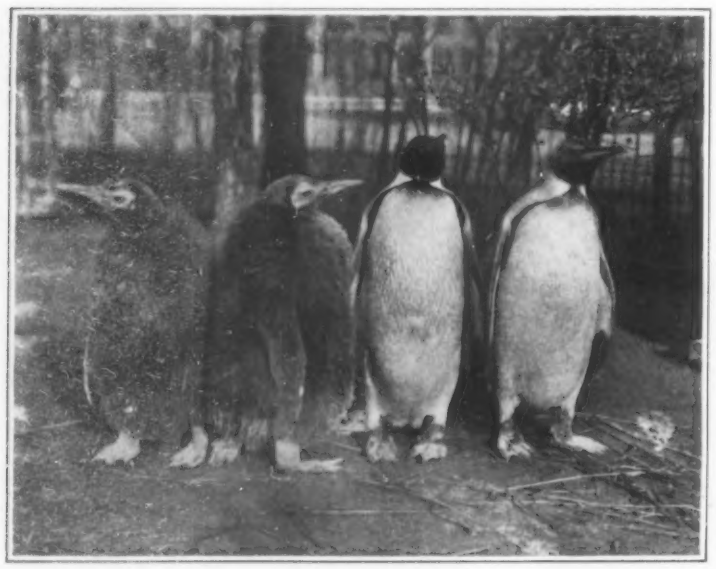
A MECHANICAL genius in Gettysburg, Pa., not only rides his motorcycle to and from work, but keeps it busy in his shop. He has rigged a device that makes it a portable power plant, operating his grinding machine. His specialty is sharpening lawn mowers, and he can double his day's output with less labor by this method. The engine is kept cool by fans, one on each side of the machine, which keep a stream of cold air blowing on it while running, and the machine often operates half a day at a time without overheating.



Motorcycle as a power plant in the amateur's shop. The engine is kept cool by means of fans.

Giant Penguins

THE accompanying photograph shows four giant penguins from the Antarctic (South Georgia). The two parent birds are white and dark brown. The young birds are covered with long gray-brown hair; it is, in fact, more like hair than like down or feathers. These penguins are also known as "royal" penguins, because of the appearance as of a regal mantle that fastens around the throat and hangs over the stumpy wings. The young have not yet grown such a mantle. These birds have just been presented to the Rotterdam Zoological Gardens, and every care will be taken to make them survive a Dutch summer. They walk upright and are very tame.

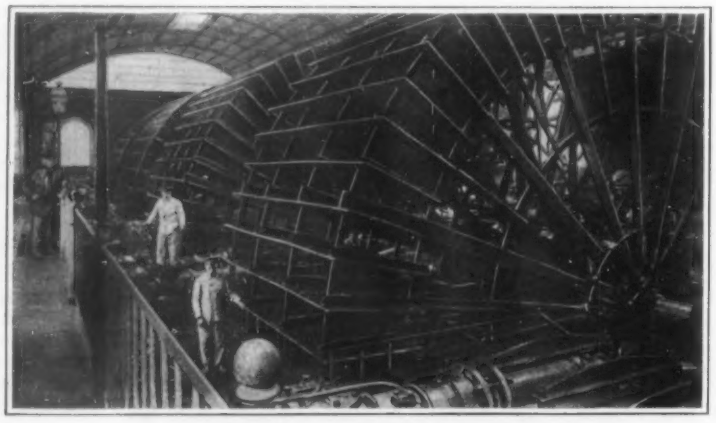


Four giant penguins from South Georgia which have been presented to the Rotterdam Zoological Gardens.

Water Power Pumping Plant of Paris

THE water-wheel plant installed upon the Seine at Bougival and known as the "Marly machine" is one of the curiosities of the suburbs of Paris. Installed in 1858 in order to raise the water of the Seine up to Versailles for the use of the numerous fountains and basins of the chateau and also for the town water supply, the present plant has been in continual operation since that time, and is likely to hold out for many years to come. The first Marly machine was built in 1686. It used quite a number of water-wheels, together with such a pumping outfit as could be contrived at the time, and was, in fact, quite a success in such a primitive stage of the engineering art. But in course of time the plant finally wore out, and was first replaced by a small steam engine plant, which was scarcely able to elevate enough water for the city use, not to speak of the fountains, but at a later date it was decided to erect the present outfit under the direction of the eminent engineer, Dufrayer. The wheel house extends part way across the Seine, and the water flows underneath the building so as to drive the undershot wheels, these being five in number, 15 feet wide and 40 feet in diameter. They are each connected to four horizontal piston pumps, one of which can be seen in the foreground. The entire capacity of the pumps is upward of 360,000 cubic feet per 24 hours. Owing to the fact that the city uses part of the water, it was decided to discontinue the use of Seine water in 1893, and to obtain a purer supply from a number of large wells in the region of the Seine, so that the pumps now deliver pure water to the city, this being further passed through sand filters located near Versailles.

Folding bandstand on wheels, which is hauled around to various parks where public concerts are given.



The forty-foot water-wheels of the "Marly machine," which pump the water for the fountains of Versailles.

A Light Machine Gun

A NEW French machine gun has recently been adopted by the American army. This weapon is hardly larger than the rifle carried by the soldiers, and yet is capable of firing 200 to 500 steel bullets per minute. It takes two men to operate it. One man feeds the long strips of cartridges into the breech of the gun from the right, while the other man aims and keeps the stream of bullets pouring in the right direction. The gun weighs only 35 pounds, and, therefore, can be easily carried by one soldier. It dismounts in three pieces, which can be assembled again for action in 10 seconds. It works close to the ground, and the operators lie on the ground, which does not make prominent targets of them. No heavy tripod is necessary for its mount. The objectionable water jacket of other machine guns is eliminated and an air-cooled radiator takes its place, which saves about 25 pounds in weight. The cartridges used are in strips of 25 each, and are the same as used by the soldiers in their rifles. The bullet weighs one half ounce, and is of steel with a lead center.

Thirty-five-pound, air-cooled machine gun, capable of firing 200 to 500 shots per minute.

Folding Bandstand on Wheels

PROVIDENCE, R. I., hires bands to give free concerts once a week in each of the parks scattered about the crowded districts. But the city did not care to build bandstands at each park, since each is used very little. Accordingly, the Park Commissioners had a portable folding bandstand built for them. When the outfit was completed it weighed 3,400 pounds. The stand, when open, has floor space of 20 by 35 feet, and will hold thirty-five chairs. The rims of the wheels are very wide so as to protect the park grass. When opened, the sides are supported by upright pieces which extend sufficiently far above the stand for electric lights to be suspended from them.

The United States Forest Service is using gasoline railway speeders for fire protection purposes. They follow up trains on steep grades where sparks thrown out by forced draft are likely to start fires.

Hands Misplaced in Egyptian Paintings and Sculptures

By James Arthur

DURING a journey up the Nile in 1908 I noticed, for the first time, a strange mixing of right and left hands in ancient Egyptian art, although I had been in Egypt before. So marked is this error that, I think, a count would show hands properly placed to be in the minority. In Fig. 1 we have Rameses I making an offering to the god Osiris, with two *right* hands, while the god's hands are correct, the "Key of life" in his right. In Fig. 2 Seti I is shown holding up his elaborate offering to the goddess Isis, with two left hands. The hands of the goddess are reversed. She holds the "Key of life" in the right hand at her left side! In these four we have all possible combinations: two rights, two lefts, right and left reversed, and right and left correct. When we consider that this went on for thousands of years it looks amazing. Surely the artists know what they were doing? Then how about the public? In trying to find some reason I noticed that the sculptor placed the thumb next the eye of the observer. This quite regardless of accuracy, it will not do to say "convention." We have plenty of conventions, especially in fashion plates, but we do not reverse things.

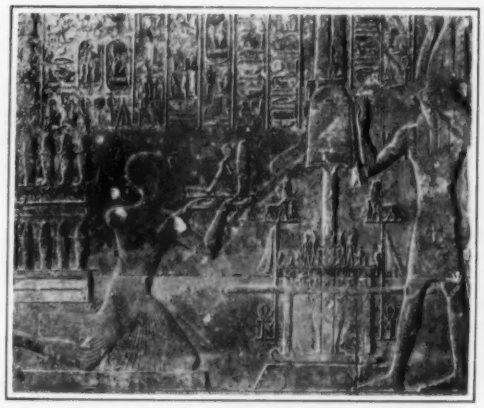


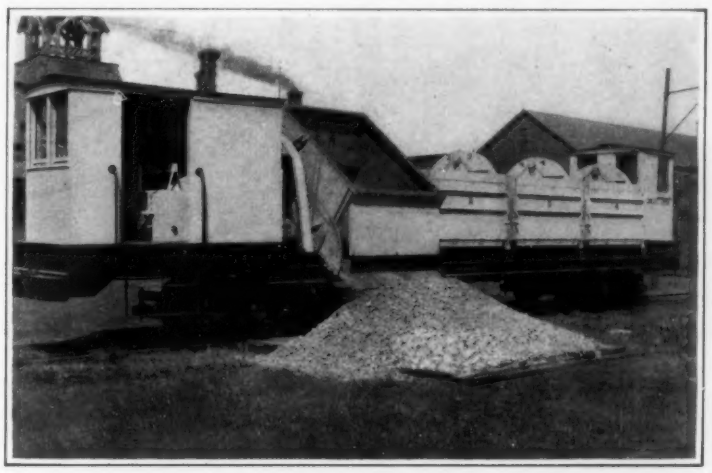
Fig. 1.—Rameses making an offering to the God Osiris, with two right hands, while the God's hands are correct.

Fig. 2.—Seti I holding up an elaborate offering to the Goddess Isis, with two left hands. Hands of Goddess are reversed.

These photographs are from sculptures in the sixth Egyptian room of the Metropolitan Museum of Art, New York city. An Egyptologist writes me that he cannot find anything printed on this matter either before or since 1908, in which year I mailed postal cards from Egypt, showing the errors.

A Sectional Dumping Car

HERETOFORE most of the dumping of roadbed material for electric lines has been done by platform labor. A modern type of dump car has recently been developed that not only does away with the unsightly string of dump cars formerly used, but eliminates the danger of running such a train of cars through congested city districts, and at the same time reduces the cost of platform labor about 50 per cent. Through the suggestion of the Public Utilities Commission and the co-operation of an electric line and well-known car builders of Springfield, Mass., the electric dump car shown herewith has been developed. The new car has four compartments which take the place of three cars of the old type. The sections can be emptied separately, or at one time. When all are dumped it requires but one minute's time. The dumping is done by cables attached to the lower corners of each section, and which run over sheaves at locations 3-3 and 4-4. When fully loaded the new carrier conveys 24 cubic yards of crushed stone, each separate section having a capacity of 6 cubic yards. Weight of car with maximum load is 72 tons; without, 21 tons. The car is equipped with four 40 horse-power motors, and air brakes. It was built at a cost of about $6,000. In the cab of the car is a 10 horse-power motor for dumping the load.



Car that may be dumped a section at a time.

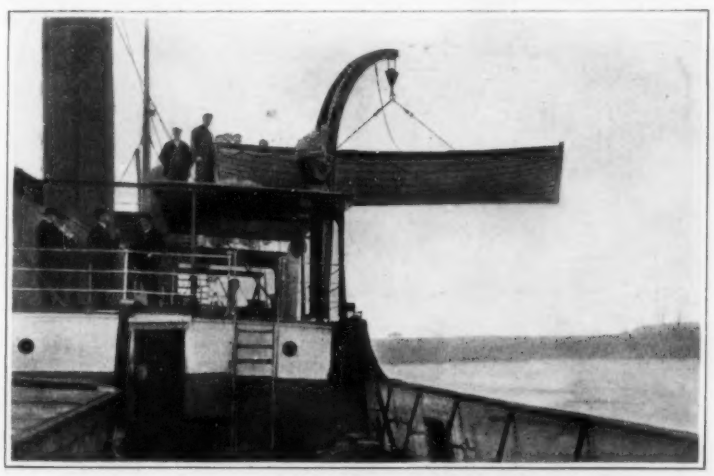
Single Boat Davit

ONE of the chief disadvantages of the common system of launching lifeboats lies in the use of two separate tackles which must be operated separately. During the panic of a shipwreck this is a source of serious confusion.

A new system of center slinging has been devised by Capt. Graham, a Glasgow shipmaster, which permits of using but a single davit, thereby greatly simplifying the launching operation. The accompanying photograph shows a davit of this type designed to handle a 28-foot lifeboat weighing 1¾ tons. The davit has a swivel bearing in the promenade deck and passes through a gland in the boat deck. The boat is hoisted by chain, which is doubled from the head of davit, led through a single sheave block, to which is attached a patent disengaging gear, which is absolutely *automatic* and cannot fail; for as soon as the boat is water borne the gear is bound to disengage.

Two men can launch the lifeboat in 50 seconds. The block can be recovered in 40 seconds ready for hooking on the second boat. On the "Titanic," the time occupied in rounding up and clearing manila tackle was 1 hour 15 minutes prior to hooking on the second boat, while the time taken on the "Olympic" at Southampton was 25 minutes, with 12 men operating. The lowering is under efficient automatic brake control, enabling one man to lower with speed and safety, on an even keel. The hook being positive in action releases the load automatically as soon as the boat is water borne. The chain travels over a sprocket wheel and stows in the hollow bottom of the davit. No handling is required, while fouling is entirely avoided. The davit may be readily modified to be operated by an electric motor.

The single davit has been subjected to most exhaustive tests by the British Board of Trade at various ports in Great Britain and has gained a certificate of approval for passenger vessels.



Launching a lifeboat with a single davit.

New Way of Treating Raw Silk

THERE is perhaps no industry in the country that has gone through so many stages of experimentation as that of silk dyeing, and it is by reason of this very fact that the silk industry has grown to such enormous proportions in the United States. A new process is now being used in the large silk-dyeing houses for the purpose of loosening the slender threads of raw silk that compose the skein, so that they will more readily "take" the dye. When the silk arrives at the dye house, after being packed in bales perhaps for months, the tiny threads are so closely pressed together that they must be separated as much as possible, and as this is not practicable by mechanical means, chemical processes must be resorted to.

Formerly this object was accomplished by using large boxes, about thirty feet long, three feet wide and three feet high. These boxes were filled with a weak solution of phosphate of soda, and the silk skeins were suspended on small wooden rods placed across the top and extending a few inches beyond the sides of the boxes. The silk was then moved back and forth in this bath by two operatives working together, one on each side of the box. At frequent intervals the silk was turned by the workmen so that all parts of it became immersed in the liquor. This process continued for about an hour, when the silk was taken out, washed and dried. The operation was repeated several times while the silk was passing through the various stages of preparation for dyeing, and it was slow and laborious work.

By the new process the phosphate of soda, of five degrees specific gravity, and heated to fifty deg. R. is placed in a series of rubber tanks, these tanks being connected with large hydro-extractors, each having a capacity of four hundred pounds of silk. Each one of the rubber tanks is supplied with a coil of lead pipe placed in the bottom through which a constant pressure of steam is forced for the purpose of heating the liquor to the required degree. The strength of the phosphate of soda solution also varies somewhat, according to the kind and quality of silk to be treated.

The silk is packed loosely in the hydro-extractors, so that the phosphate of soda may thoroughly permeate every part of it and the machine is then slowly revolved while the phosphate of soda is pumped into it from the rubber tanks. As soon as they are filled the flow of soda is turned off and the hydro-extractors continue to revolve slowly for about an hour. In this way every part of the four hundred pounds of silk which they contain is thoroughly permeated, and the fine threads of silk loosened in the skein and separated from each other, so that they can easily become saturated with the other chemicals and dyes used in the process of dyeing.

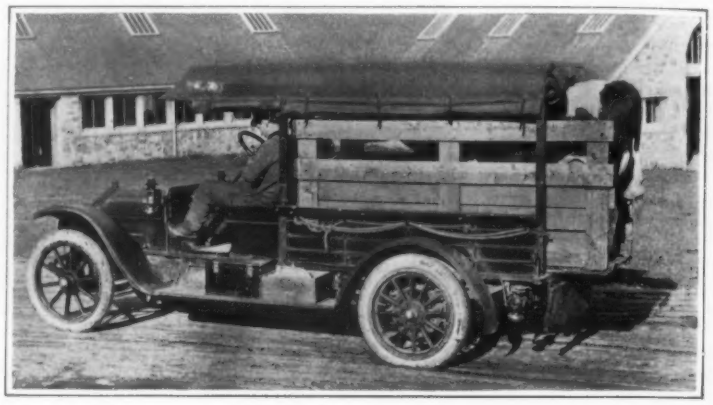
At the expiration of an hour the hydro-extractor is stopped and the phosphate of soda solution allowed to run back into the rubber tanks until the machine is empty. The hydro-extractor is then rapidly revolved or "whizzed" for ten or fifteen minutes until the silk is thoroughly dry. It is then taken out and a fresh supply of silk is put into the machine. The silk is washed on a washing machine, dried in a smaller hydro-extractor, and is then ready for the subsequent processes. By means of the new method of treating the silk the output of the dye houses is increased about one fourth and the cost of treating the silk materially reduced.

Sponges as a Fertilizer.—Mr. Joseph G. Smith of the United States Bureau of Soils has called attention to the present use and future possibilities of the loggerhead sponges of the Florida Keys as a fertilizer. They are said to grow in countless thousands in shallow water, where they are easy to gather, and citrus groves on the neighboring mainland have been fertilized with them with very satisfactory results.

The Motor-driven Commercial Vehicle

This department is devoted to the interests of present and prospective owners of motor trucks and delivery wagons. The Editor will endeavor to answer any questions relating to mechanical features, operation and management of commercial motor vehicles.

The dumping truck serves a variety of purposes.



Giving the cow a ride.

The Motor Truck on the Farm

By Ross Babcock, M.E.

TO the imaginative man, the place of the horse on the modern farm already has been taken by the massive motor truck and the scarcely less feebly kicking gasoline-motor-of-all-work. For though there is no new thought in the expression "the horse must go," the suggestion is there just the same—and it is a suggestion that is all the more potent because of the rapid strides that have been made by the farmer during the past year in adopting for his very own the type of horseless vehicle that was designed primarily for more densely populated trade centers, where the call of the crow and the smell of the soil never penetrate.

Part of the suggestion is conveyed by the very evident manner in which the present-day motor truck builder is endeavoring, either directly or indirectly, to cater to the needs of the farmer. He is endeavoring not so much to give the farmer what the manufacturer thinks he ought to have as to give him what he wants, never once forgetting, however, that minds trained to the ways of the draft animals may not be quite as quick as are other minds to grasp the significance of specially developed vehicles that not infrequently appear to the less sophisticated layman somewhat as round pegs in square holes.

The manufacturer has shown by his attitude that he is willing and anxious to hold out a helping hand to the man behind the plow—to assist him to a better place in the world by solving at least a part of his transportation problems for him. And that the manufacturer really is sincere in his manifestations scarcely permits of question, for he knows that as a general rule the farmer will be far more considerate of his power-driven equipment than will the average individual engaged in some other business, and that the ultimate benefit will be as much his own as it is the farmer's.

In many respects, the farmer whose acres lie within a radius of fifty miles or so of a big metropolis has a distinct advantage over his brothers whose farms are located less conveniently to the ultimate market. He can, if he will, transport at least a part—probably the more perishable part—of his produce by motor truck more quickly than by railroad in a great many cases, and with greater certainty that it will reach its destination on time and in prime condition.

As just one concrete example of the superiority of the motor truck over the horse-drawn vehicle, the case of one influential Long Island farmer may be cited. With a five-ton truck, this man, whose farm is situated about thirty-five miles from the New York market, carries twice, and sometimes three times, as much produce to the city in one load as could be carried by one wagon and team, and he does it in a fraction of the time, and at a fraction of the cost of his horsed equipment.

For work of the kind, the heavier type of vehicle of from three to five tons capacity is the best, and in this connection it is interesting to note the tendency toward increased efficiency by reducing idle time to the minimum. The removable body has had an exemplary effect in promoting efficiency.

In operation, the removable body—generally there are several of them where the volume of the work warrants—is loaded while resting upon a "dead" wagon, which can be moved either by hand or by horses nearer to the work as the loading progresses. The truck chassis is in the mean time employed in doing other work, or, where several removable bodies are used, in transporting a load in one of them. "Dead" wagons are not necessary, of course, though they are a convenience. The removable bodies may be dismounted (by the power of the engine, be it added) upon suitable platforms conveniently located.

How does all this affect the farmer? Let us suppose a hypothetical case which may not be so hypothetical after all. Farmer Smith is located, say, three or four miles from his nearest railroad shipping point. What will one three-ton chassis and three removable bodies do for him?

Assuming that one body is continually on the chassis *en route* to or from the station, which is the theory of motor trucking for real efficiency, the other two rest on easily erected loading platforms near to, or actually in, the field where the harvesting is being done. The truck returns from the railroad station minus its body, which is unloaded during the time the truck can return to the field, pick up another loaded body and make the trip to the station. Arrived, the unloaded body is substituted for the loaded one and the process repeated as many times as may be necessary.

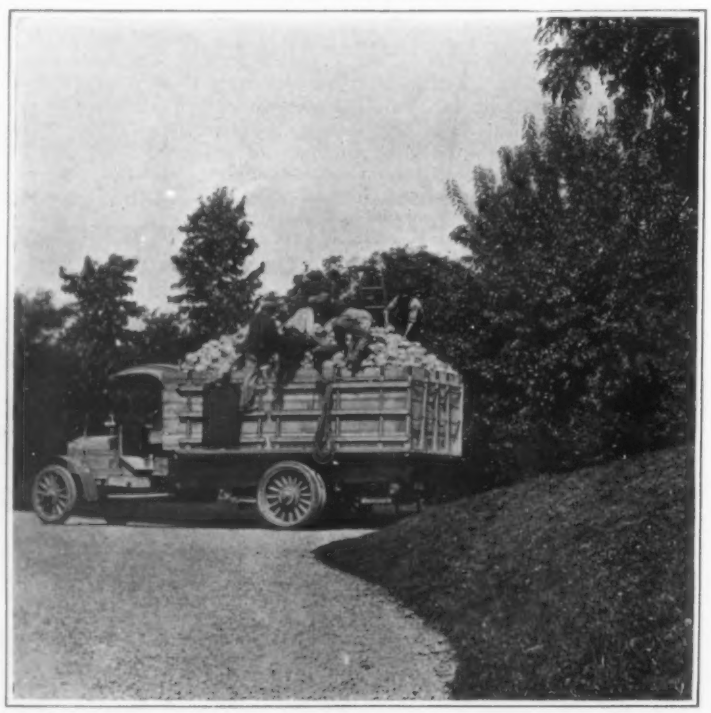
By such means it is possible for the farmer to get all of his produce actually on the market days before "the other fellow," and, therefore, he is in a position to command better prices.

Needless to point out, a motor truck always can be used as a tractor and quite frequently it is possible to load the truck itself and then to hitch an ordinary produce wagon on behind for a trailer, in this way practically doubling the capacity of the truck.

Where the ordinary produce wagon is used for a trailer, however, a note of warning against excessive speed should be apparent, for obviously the wagon is not constructed for speed and cannot be expected to "stand up" under the strain of other than a moderate rate of progression.

As a means of carrying dairy products to a nearby market, there is much to be said in favor of the lighter power wagons. They are economical and comfortable, for as a rule, they are better sprung than are their horse-drawn predecessors—they must be better sprung to protect their mechanism—they are easily operated, and last, but not least, no weather holds terrors for them. They will fairly skim over ice and snow, and there is no necessity for curtailing speed. Similarly, they offer exceptional opportunities for providing protection for the operator, for though

Hauling a heavy load up hill.



Piling on a generous load of cabbage heads.

INQUIRY COLUMN

READ THIS COLUMN CAREFULLY. You will find inquiries for certain classes of articles numbered in consecutive order. If you manufacture these goods write us at once and we will send you the name and address of the party desiring the information. There is no charge for this service. *In every case it is necessary to give the number of the inquiry.* Where manufacturers do not respond promptly the inquiry *may* be repeated.
MUNN & CO., INC.

Inquiry No. 9355. Wanted the name and address of the maker of triplex glass.

Inquiry No. 9356. Wanted the name and address of a manufacturer who can build an *automobile wheel*, also a *cigar vending machine*. Concerns in the middle West preferred.

Inquiry No. 9357. Wanted the name and address of a manufacturer of a machine for scalloped paper favors and cups.

Inquiry No. 9358.—Wanted the name and address of maker of a machine to cut all granulate leather.

Inquiry No. 9359. Wanted the name and address of a firm that makes razor blades for all makes of safety razors.

Inquiry No. 9360. Wanted the name and address of parties making pipe fittings such as ferrules, stems and bowls such as could be used in the making up of calabash pipes for smoking.

Inquiry No. 9361. Wanted to buy a Nut Cracking Machine, especially good for Pecans.

Inquiry No. 9362. Wanted the name and address of the makers of a machine for splicing ties.

Inquiry No. 9363. Wanted the names and addresses of manufacturers of machinery for printing on intaglio copper plates.

Inquiry No. 9364. Wanted the name and address of buyer of mica in a crude state.

Inquiry No. 9365. Wanted the name and address of a manufacturer of machinery for embossing tin foil as is used in packing cigarettes.

Inquiry No. 9366. Wanted the name and address of a manufacturer of wire wheels, front axles complete with steering or separate, light sheet metal bodies, fuel tanks with cocks, pressed steel frames, mufflers, motors of the two cylinder opposed type, cushions and many smaller parts for cycle cars.

Inquiry No. 9367. Wanted the name and address of a manufacturer of an automatic centering machine.

Inquiry No. 9368. Wanted, the name and address of glass-bottle manufacturers or glass blowers who can manufacture a glass bottle and perforate it with some 12 small holes, in large quantities for export, to sell at a popular price.

Inquiry No. 9369. Wanted, the names and addresses of users of Indian Steatite (Soapstone), Corundum and other Indian minerals, in quantities.

Inquiry No. 9370. Wanted the names and addressess of manufacturers of small wooden articles, particularly in such soft woods as pine and fir, for articles such as toys, furniture, etc.

Inquiry No. 9371. Information wanted where one could buy or have made to order machine to be used for making solid back brushes.

Inquiry No. 9372. Wanted the name and address of manufacturers of a collapsible box about 12 inches square. It must be strongly made to withstand rough usage in transit.

the horse may be overloaded by such extra weight as is represented by a closed "cab" the power wagon carries it easily.

Buying the Truck on the Instalment Plan

By James McLean Helford

IN many instances, the intending purchaser of a motor truck is confronted with one or both of two difficulties—even after he has become convinced that a commerical vehicle installation will prove profitable in his business. He may be unable to supply the necessary capital to purchase an expensive truck outright; or he may have so large an investment in horse and wagon equipment that he could not easily convert their value into cash. In the latter instance, it would prove far more profitable for the owner to sell his horse and wagon equipment piecemeal and to invest immediately in one or more of the necessary trucks—as his business warrants.

But to such would-be purchasers of motor trucks, many manufacturers and dealers offer relief. While there may seem to be more or less odium and a sense of instability attached to the word "instalment," it represents a pure and simple business proposition, and is a plan whereby many a reputable merchant is enabled to continue with a profitable enterprise. Just as no large office building is erected for "cash" or is completed without the floatation of bonds or mortgages, so should it hardly be expected that every large business house would be willing to purchase its entire commercial vehicle equipment in a lump sum. But if a man desires to take advantage of any of the several instalment or "part payment" plans of selling motor trucks, he must first convince the manufacturer or dealer of his reliability and financial standing. It is evident, therefore, that the credit department of the truck manufacturer takes an important position in regard to these time sales, and the business record of the intending purchaser is carefully investigated.

Further than this, the truck companies do not look with favor upon propositions in which it is found that the would-be purchaser is depending upon the truck itself to show a sufficient profit to meet the payments and interest when they become due. Improper handling, wrong routing, or many another condition can seriously affect the earning capacity of a motor truck, and therefore the intending purchaser must of necessity be able to show other sources of income before he can be considered a fit subject for the receipt of a car on the instalment basis. The purchase of a truck in such a manner, therefore, betokens strict business integrity, and far from being the rather questionable undertaking that many consider it, it becomes a high-class, legitimate proposition.

One large concern that has recently adopted the instalment system of selling trucks charges the full list price for vehicles so purchased. Twenty-five per cent of this list price is exacted to include the delivery of the truck, and the remainder is due within one year, in the form of twelve, equal, monthly payments. These payments are guaranteed by notes which bear six per cent interest and which, in some instances, must be indorsed by the dealer consummating the sale. In addition, the purchaser, upon delivery to him, must insure the truck for one year to cover fire, accident, and liability, and while such policies may be made out in the buyer's name, they must bear an indorsement in the form of a "rider," signing over to the manufacturers the amount of the policy, "as their interest may appear"—as it is stated in insurance parlance.

This provision regarding the insurance is made because the manufacturer holds title to the truck until the last of the notes, together with interest, has been paid. In order to establish this title, a lease or a chattel mortgage on the truck must be executed before the proper officer. Inasmuch as the law regarding the nature of such an obligation varies in different

States, such papers must be passed upon by the purchaser's attorney, who must make a written statement to the effect that the lease or mortgage as executed is prepared according to the legal form enacted in the State in which the purchaser of the truck and the signer of the notes resides. He must also certify that such papers have been properly recorded in order fully to protect the manufacturer in the case of default on the part of the intending purchaser.

In order to make such an instalment system the more clear, let us consider the case of a light truck selling at an arbitrary figure—$1,350 say, to make the calculations "come out even." One fourth in some instances, and one third in others, is to be paid in cash. Assuming one third of the total to be required at the time of purchase, the cash due is $450, and the remaining $900 is to be paid in the form of ten or twelve monthly notes, with interest at 6 per cent.

In addition to the 6 per cent interest charged on the notes covering the unpaid balance on the truck, some concerns purposely charge on the basis of a greater total than that for which the truck could be purchased for cash. That is, for example, 6 per cent will be deducted from the list price that forms the instalment plan charge, if the truck is to be purchased for cash, and the buyer therefore saves, not only the interest on his notes, but also an additional 6 per cent on his investment.

The fact that many hard-headed business men have taken advantage of these instalment offers on the part of some of the motor truck manufacturers is evidence of the soundness of the business policies involved. The motor truck business is still in its infancy, and it is but natural that such inducements should be made to prospective buyers as are offered to purchasers of articles that have been before the public for a much greater length of time. If the motor truck is indispensable, as it is surely proving itself to be, it should be made available for every small merchant and truckman who now uses but one or two horses and wagons, as well as for the large department store employing a fleet of a hundred commercial vehicles in its delivery system.

Motor Truck Notes and Queries

P. B. J. writes: "Why are the dual, or twin, tires used on large trucks? Would it not be cheaper to use one large tire on each rear wheel?"

A. The weight carried by each inch of tire width should not exceed a certain amount. Therefore, when a heavy truck is loaded with several tons, the required width of tire becomes so great as to make a single tire exceedingly unwieldy. Furthermore, the cost of production of such a tire would be greater than that of two of one half the width. It is also possible that one of the dual tires would wear more rapidly that its companion on the same wheel, and in this event, only the imperfect one need be replaced. Another important consideration in favor of the use of dual tires on large trucks is the better facilities afforded for attaching the two separate tires to the rims of the wheel.

H. J. W. writes: "I understand that ten or twelve miles an hour is the speed limit recommended by tire and truck manufacturers for vehicles of three-ton capacity. I have heard the term 'high-speed trucks' used, however, and would like to know what is the speed and capacity of such, and what is their tire equipment."

A. Such vehicles are really more of the nature of delivery cars than trucks, for their total load seldom exceeds three quarters of a ton. A commercial vehicle of this type may be run at twenty miles an hour, or more, while many have speed capabilities of thirty and thirty-five. In the latter instance, pneumatic tires should as a rule be used, for their greater resiliency enables such speeds to be obtained without seriously affecting the motor, transmission, and other mechanical parts. Solid tires can be used on light trucks that do not exceed a speed of twenty

miles an hour, but as a rule, pneumatics are the more popular equipment. A seemingly satisfactory compromise has been reached by at least one maker of a light truck, who employs solid tires at the rear wheels, where the wear caused by the tractive effort is greater, and pneumatics in front, where the weight distribution is less, and where the motor may be partially insulated from many of the excessive shocks of high-speed travel.

M. A. L. writes: "One of the cylinders of the motor in my three-ton truck has suddenly lost its compression-retaining ability, and, therefore, does not deliver its full share of the power. The garage man tells me that the rings have probably worked around so that the opening of each is opposite that of its neighbor. Please tell me how this may be accounted for and how a repetition may be prevented."

A. We assume that there are three rings on the piston in question. When the motor is assembled, the opening of each ring should be opposite the "back" of the one adjacent to it. That is, if the first ring is set with its opening toward the front of the motor, the second should be placed so that its opening faces the rear of the motor; the third ring, in turn, will then face forward. The rings should be held in these relative positions by notches in the edge of their open ends that fit into pins set into the proper places in the ring grooves of the piston. Insamuch as the openings of the first and third rings are in a line with each other, it is only necessary that the middle ring be moved out of place half a turn, or 180 degrees, before a free path for the escape of the gas in the cylinder will be furnished. To be sure, it is seldom that the ring can "ride" up on its pin, and yet through a faulty installation, several instances of this have been known to occur. The remedy lies in reinstalling the ring in its proper position, or in the use of a type of ring that has no free opening for the escape of the compressed gas. This latter type is really two rings in one. These are mounted concentrically, with the flanged edge of one overlapping that of the other so that both the outside and inside present a smooth surface. Each of these two rings has its own notched opening, but as this rests firmly against either the inside or outside surface of its companion ring, the device is elastic and flexible without affording a single break in the contour of the ring as a whole.

P. W. H. writes: "My truck is equipped with single, four-inch solid tires. As the frame and motor seem to be easily capable of carrying nearly double the rated load, and as I understand that overload injures the tires more than any other part of the truck, could I increase the carrying capacity of the truck one hundred per cent by replacing my rear wheels with those having dual rims on which twin four-inch tires would be used?"

A. While it is true, as you say, that the tires are the principal sufferers from overloading, nevertheless, the motor and transmission may be harmed by such a practice, and we would strongly urge you to keep the average loads of your truck well within the limits set by the manufacturer. Furthermore, it is not considered that two tires of a given size will carry double the load for which a single tire of the same size is suited. For example, if a four-inch tire can support a thousand-pound load without difficulty, it is assumed by conservative manufacturers that four-inch dual tires will carry fifteen hundred pounds with the same margin of wear. This allowance is made to provide for the times when one or the other of the dual tires will carry the entire load of that wheel, as, for instance, when the truck passes over a stone or a rut that comes in contact only with one of the dual tires.

The Crozet Islands, in the southern Indian Ocean, have been annexed by France. They are uninhabited and are rarely visited, though they lie near the route between Cape Town and Melbourne. The "Gauss" Antarctic expedition paid a visit to the islands in 1901.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

ADJUSTABLE SHOE BUCKLE FASTENER.—C. M. BONHAM, 2134 Seventh Ave., Manhattan, N. Y., N. Y. This invention relates to shoe buckles or ornaments adapted to be used particularly in connection with pumps, although it is not limited exclusively to this application, and the invention has to do more especially with fastening or attaching devices for buckles or other ornaments.

STORM SLEEVE.—H. HERTZ, 115 E. 96th St., New York, N. Y. This invention provides a garment having sleeves for coats adapted particularly for chauffeurs or other drivers, and having the appearance of ordinary sleeves provided with outer cuffs, but in another adaptation providing effective hand coverings, keeping out wind, snow, or rain, the arrangement being such in the latter adaptation as to completely exclude the elements.

Of General Interest.

COMBINED CHAIR AND BASKET.—B. H. GOLDSTEIN, care of J. Cohnen & Bros., 223 Cherry St., N. Y., N. Y. This invention relates to improvements in combined chairs and baskets, and has for an object the provision of an improved structure which will afford a seat for an operator and a suitable convenient receptacle for the operator's work.

MONOCLE AND THE LIKE.—H. T. LOUCH, 65 Hatton Garden, London, E. C. England. This invention relates to monocles, magnifying lenses and the like, which are usually held in position by contraction of the muscles in the neighborhood of the eyes, the object of the inventor being to devise such improvements as will enable the articles to be held in position while at the same time conducing to the comfort of the wearer without impairing the efficiency of the device, or rendering it unsightly.

STILL.—C. L. TURNER, 180 Madison Ave., Tompkinsville, N. Y. This invention provides a still wherein fractional and continuous distillation may be performed; provides a still for the production of fractional distillation of hydro-carbon oils or other volatile liquids; provides means for conserving the heat employed in the distillations; and provides means for increasing the output of stills adapted for practical distillation.

Hardware and Tools.

KEY RING LOCK.—D. C. EN EARL, Hotel Colorado, 1634 Larimier St., Denver, Colo. The purpose here is to provide a lock which is in the nature of a puzzle that may be readily operated by one who understands the construction and purpose of the lock, but which is exceedingly difficult to open by one who does not understand the operation.

VALVE GRINDING TOOL.—H. R. PARSONS, Sharpsville, Pa. The invention pertains to valve grinding tools utilized to grind in valves on automobile motors and other mechanisms where valves are used, the object being to provide a tool having means to engage a valve, and also provided with means whereby the operator may readily and conveniently press downwardly upon the same and rotate it at the same time, utilizing both hands in part performance of each operation.

DEVICE FOR OPENING ELLIPTICAL SPRINGS.—C. N. SOWDEN, Guantanamo, Cuba. This invention relates to a device to be applied to laminated or leaf springs, such as elliptical or semi-elliptical springs; and more particularly refers to that form of device for the indicated purpose, in which opposed wedge members have relative movement toward and from each other, to be entered between the leaves of the spring and withdrawn therefrom.

Heating and Lighting.

SAFETY VALVE.—H. STEINBERG, Huntingdon, Pa. This inventor provides a safety valve for attachment to a hot water boiler, especially those connected with stoves and ranges, which will serve the purpose of permitting the escape of excessive steam pressure when the water reaches a boiling point, thus obviating explosions which commonly occur.

Household Utilities.

FOLDABLE GAS STOVE.—R. S. WAY, 415 No. Grand, Los Angeles, Cal. This stove is adapted to be folded into a casing set in a recess in a wall, to take up little room and not detract from the appearance of the apartment, to allow of easily unfolding the stove for use, and to automatically shut off the gas supply when folding it into the casing or to turn on the gas supply when moving the stove into extended position.

SANITARY GARBAGE RECEPTACLE.—S. I. SEGALL, 2018 83rd St., Brooklyn, N. Y. This invention has reference to storage receptacles designed to store garbage, trash and the like, and has for an object to provide an improved structure which will automatically close itself after each time the same is opened.

CURTAIN CLASP.—W. H. WALLIN, Box 5, R. F. D. No. 2, Stromsburg, Neb. This improvement relates to devices for clasping a curtain on a curtain pole to prevent the curtain from bunching and to maintain it properly draped. It provides a clasp having effective gripping engagement with a curtain, and one capable of a great variety of ornamental effects.

Machines and Mechanical Devices.

APPARATUS FOR TAKING OR REPRODUCING ANIMATED PICTURES.—L. H. HUET, 114 Rue du Temple, Paris, France. The present invention has for its object a special operating device obviating numerous disadvantages. By reason of its special combination, this device puts kinematography within reach of the public and enables photograph amateurs to take successively several animated scenes without being compelled to go in a dark room for substituting a plate for another one in the photographic apparatus.

TANK SIPHON.—P. BALZE, 200 Christie St., Leonia, N. J. This invention relates to water distribution, and has particular reference to siphons for periodically delivering fluids, especially water, from tanks. Among the objects is to provide a siphon adapted especially for flush tanks, the nature of the siphon being such that it is valveless and hence precludes any possibility of leakage.

PROJECTING APPARATUS FOR MOVING PICTURE MACHINES.—G. E. RIPLEY and W. N. GLADSON, Fayetteville, Ark., and R. E. THOMPSON, Heber, Ark. Address the second, care of University of Arkansas, Fayetteville, Ark. The invention is an improvement in projecting apparatus for moving picture machines, and has in view a reflecting mechanism to cause the image of one picture to dissolve into the next without employing a tinted or softening light, or otherwise lessening the brilliancy of the screen during the picture change.

MACHINE FOR CUTTING BREAD.—E. SCHMIDT, Geb. Walter, Berlin-Tegel, Germany. This invention relates to a machine for cutting bread. It is provided with a knife adapted to operate like a lever, the loaf of bread to be cut being placed on a grid consisting of rods, which, when the machine is in use, are at right angles to the knife. The ends of the rods are secured to standards, to one of which the knife is pivoted.

Railways and Their Accessories.

CAR FENDER.—J. P. GERAGHTY, 50 Hamilton Place, Jersey City, and G. W. NAYLOR, Jersey City, N. J. The invention provides a fender more especially for use on surface cars and arranged to normally hold the apron frame a distance above the track to clear switches, paving stones, etc., to cause the apron frame to move in an inclined position on a person or other object falling onto the track, and being struck by the gate, and to immediately cause the apron frame to swing back into normal position as soon as the person or object passes onto the apron frame, thus preventing person or object from being run over or injured by preventing a hand or foot from passing under the apron frame.

Pertaining to Vehicles.

SIGNALING APPARATUS.—E. D. LOPEZ, New Orleans, La., care of Elite Letter Co., 41 W. 33rd St., New York, N. Y. This device is for use on automobiles and other moving vehicles, and the object of the invention is to enable the driver to give notice to the car behind whenever he intends to stop or turn, without necessitating the removal of the driver's hands from the brakes or steering gear when the operation of stopping or turning is to be effected.

ACTUATING MEANS FOR SWIVEL LAMP HOLDERS.—C. N. SOWDEN, Guantanamo, Cuba. This invention relates to lamp holders for automobiles, locomotives, and other vehicles having means for automatically turning the holder in the direction in which the vehicle is turned, and manually controlled actuating means. It refers more particularly to lamp holders and their appurtenances of the character forming the subject of the application filed by Mr. Sowden, Serial No. 728,976.

AUTOMOBILE FENDER.—J. B. FORET, 633 Biddle Ave., Ford City, Mich. By means of this device a person who happens to be in front of an automobile may be prevented from suffering injury by the vehicle. The fender has a grab rail, which may be seized and which tends to cause the lifting of the outer portion of the fender, thereby removing the person's clothing from the ground and preventing it being caught between the fender and the ground.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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Scientific American Supplement No. 1667—*Some Soldering Appliances*, describes the blowpipe and the furnace in their various forms.

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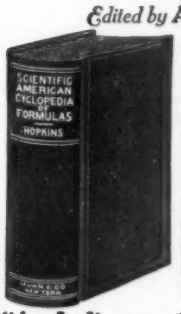

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